# GUESS PAPER & MODEL PAPER # 1

## BASED ON CHAPTER # 10 & 11 (Reduced Syllabus)

# GASEOUS EXCHANGE
# HOMEOSTASIS

**NOTE:**

1. **Only topic based relevant MCQs. Short and Long Questions are included.**
2. **All information in side boxes is excluded.**

| Chapter Name | Topics Included |
|---|---|
| **Gaseous Exchange (Chapter # 10)** | Gaseous Exchange in Plants (page 2-3)<br>Gaseous Exchange in Humans (4-6)<br>The Lungs (6)<br>Mechanism of Breathing (7) |
| **Homeostasis (Chapter # 11)** | Osmotic Adjustment in plants (20-21)<br>Urinary System of Human<br>Structure of Kidney, Functioning of Kidney, Osmoregulatory Function of the Kidney (22-26)<br>Dialysis (27-28) |

## SECTION – A (Marks 12)

**Time Allowed: 20 minutes** **Total Marks: 12**

**Note: Section-A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.**

**Q.1 Encircle the correct option i.e. A / B / C / D. All parts carry equal marks.**

**i. The process of gaseous exchange involves;**
- A. Breakdown of C-H bonds to yield energy
- B. Physical movements that take air in and out of body
- C. Getting oxygen from the air and removing carbon dioxide
- D. Transport of oxygen by the blood to different parts of the body

**ii. Most of the gaseous exchange in a leaf occurs through;**
A. Stomata B. General surface C. Cuticle D. Lenticels

**iii. How many bronchi are there in the air passageway?**
A. One B. Two C. Many D. None

**iv. Where does the gaseous exchange occur in humans?**
A. Pharynx B. Trachea C. Bronchi D. Alveoli

**v. Which structure actively helps in taking the air out of lungs?**
A. Nasal cavity B. Bronchus C. Bronchiole D. Diaphragm

**vi. The primary chemical stimulus for breathing is the concentration of;**
A. Carbon dioxide in blood B. Oxygen in blood
C. Carbon dioxide in muscles D. Oxygen in muscles

- C. In emphysema the walls of alveoli break and there is more surface area
- D. Dust particles can damage the lung by irritating the inner alveoli surface

**viii. Which process does NOT occur in the nasal cavity?**
- A. Trapping of large dust particles
- B. Humidification of the inhaled air
- C. Warming of the inhaled air
- D. Exchange of gases

**ix. What type of blood vessels surrounds the alveoli?**
- A. Artery B. Arteriole C. Capillary D. Vein

**x. The human urinary system consists of;**
- A. Rectum, lungs, kidneys, ureters
- B. Kidneys, ureters, urinary bladder
- C. Skin, liver, lungs, kidneys
- D. Kidneys, ureters, urinary bladder, urethra

**xi. Which organ is responsible for filtering the blood?**
- A. Intestine B. Brain C. Stomach D. Kidney

**xii. The tube between kidney and urinary bladder is the;**
- A. Ureter B. Urethra C. Renal tubule D. Nephron

# BIOLOGY SSC-II

**Time allowed: 2:40 Hours** **Total Marks: 53**

**NOTE: Answer any six parts from Section 'B' and attempt any five parts from Section-C. Attempt any two questions from Section 'D' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet–B if required. Write your answers neatly and legibly.**

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 x 3 = 18)**

- i. Trace the path of air from the nasal cavity to the alveoli.
- ii. How will you differentiate between a stoma and a lenticel?
- iii. How do the different parts of the plant body exchange gases with the environment?
- iv. Write down the steps of inhalation and exhalation.
- v. Briefly describe human breathe rate per minute in different circumstances.
- vi. Identify and label the following: diagram.

- vii. Describe the process of selective re-absorption in the kidneys.
- viii. What is the functional unit of the kidney? Describe its structure and draw labeled diagram.

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 x 3 = 15)**

- i. What steps are involved in the formation of urine in the kidneys?
- ii. Write a note on halophytes.
- iii. Enlist the normal chemical composition of urine?

**ختم نبوت ﷺ زندہ باد** | **عظمت صحابہ زندہ باد**

**السلام علیکم ورحمۃ اللہ وبرکاتہ:**

معزز ممبران: آپ کا وٹس ایپ گروپ ایڈمن "**اردو بکس**" آپ سے مخاطب ہے۔

**آپ تمام ممبران سے گزارش ہے کہ:**

- گروپ میں صرف PDF کتب پوسٹ کی جاتی ہیں لہذا کتب کے متعلق اپنے کمنٹس / ریویوز ضرور دیں۔ گروپ میں بغیر ایڈمن کی اجازت کے کسی بھی قسم کی (اسلامی وغیر اسلامی، اخلاقی، تحریری) پوسٹ کرنا سختی سے منع ہے۔
- گروپ میں معزز، پڑھے لکھے، سلجھے ہوئے ممبرز موجود ہیں اخلاقیات کی پابندی کریں اور گروپ رولز کو فالو کریں بصورت دیگر معزز ممبرز کی بہتری کی خاطر ریموو کر دیا جائے گا۔
- کوئی بھی ممبر کسی بھی ممبر کو انباکس میں میسیج، مس کال، کال نہیں کرے گا۔ رپورٹ پر فوری ریموو کر کے کاروائی عمل میں لائے جائے گی۔
- ہمارے کسی بھی گروپ میں سیاسی و فرقہ واریت کی بحث کی قطعاً کوئی گنجائش نہیں ہے۔
- اگر کسی کو بھی گروپ کے متعلق کسی قسم کی شکایت یا تجویز کی صورت میں ایڈمن سے رابطہ کیجئے۔
- سب سے اہم بات:

**گروپ میں کسی بھی قادیانی، مرزائی، احمدی، گستاخِ رسول، گستاخِ امہات المؤمنین، گستاخِ صحابہ و خلفائے راشدین حضرت ابو بکر صدیق، حضرت عمر فاروق، حضرت عثمان غنی، حضرت علی المرتضیٰ، حضرت حسنین کریمین رضوان اللہ تعالیٰ اجمعین، گستاخ اہلبیت یا ایسے غیر مسلم جو اسلام اور پاکستان کے خلاف پراپیگنڈا میں مصروف ہیں یا ان کے روحانی و ذہنی سپورٹرز کے لئے کوئی گنجائش نہیں ہے لہذا ایسے اشخاص بالکل بھی گروپ جوائن کرنے کی زحمت نہ کریں۔ معلوم ہونے پر فوراً ریموو کر دیا جائے گا۔**

- تمام کتب انٹرنیٹ سے تلاش / ڈاؤنلوڈ کر کے **فری آف کاسٹ** وٹس ایپ گروپ میں شیئر کی جاتی ہیں۔ جو کتاب نہیں ملتی اس کے لئے معذرت کر لی جاتی ہے۔ جس میں محنت بھی صرف ہوتی ہے لیکن ہمیں آپ سے صرف دعاؤں کی درخواست ہے۔
- عمران سیریز کے شوقین کیلئے علیحدہ سے عمران سیریز گروپ موجود ہے۔

**لیڈیز کے لئے الگ گروپ کی سہولت موجود ہے جس کے لئے ویریفکیشن ضروری ہے۔**

- اردو کتب / عمران سیریز یا دیگر گروپ میں ایڈ ہونے کے لئے ایڈمن سے وٹس ایپ پر بذریعہ میسج رابطہ کریں اور جواب کا انتظار فرمائیں۔ برائے مہربانی اخلاقیات کا خیال رکھتے ہوئے موبائل پر کال یا ایم ایس کرنے کی کوشش ہر گز نہ کریں۔ ورنہ گروپس سے تو ریموو کیا ہی جائے گا بلاک بھی کیا جائے گا۔

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|---|---|---|
| محمد سلمان سلیم | پاکستان زندہ باد | راؤ اماز |


اللہ تبارک تعالیٰ ہم سب کا حامی و ناصر ہو

v. The urinary system of humans is the major organ involved in homeostasis in human body state the role of the urinary system of humans in homeostasis?

vi. Define the following terms.

a. Nasal cavity b. Nostril c. Alveolar duct

vii. Define the following terms.

a. Papillary ducts b. Peritoneal dialysis c. Pressure filtration

## SECTION – D (Marks 20)

Note: Attempt any TWO questions from the following. All questions carry equal marks. (2 ×10 = 20)

Q4. a. How do the different parts of humans body exchange gases with the environment?
b. Describe the process of osmotic adjustments in plants?

Q5. Describe the structure and labelled diagram of kidney?

Q6. Explain the different methods of dialysis?

# SOLUTION OF GUESS PAPER & MODEL PAPER # 1

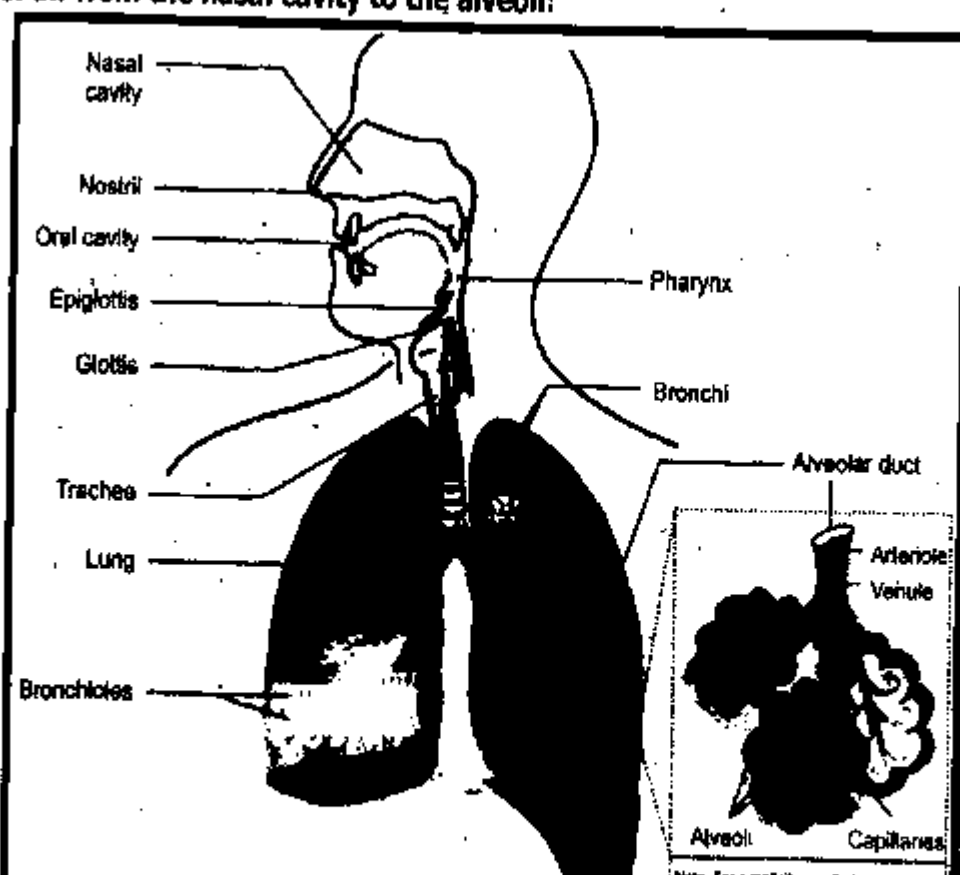
## SECTION- A (MCQs)

| i. C | ii. A | iii. B | iv. D | v. D | vi. A |
|---|---|---|---|---|---|
| vii. C | viii. D | ix. C | x. D | xi. D | xii. A |

## SECTION-B (Marks 18)

Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)

i. Trace the path of air from the nasal cavity to the alveoli.

Ans: Path of air from the nasal cavity to the alveoli:

**ii. How will you differentiate between a stoma and a lenticel?**

**Ans: Difference between a stoma and a lenticels:**

| Stoma | Lenticels |
|---|---|
| **i.** Stoma are present on the lower surface of leaf. | **i.** Lenticels are present on the outer layer of woody or hard stem. |
| **ii.** They are involved in gaseous exchange, transpiration, removal of extra water and waste. | **ii.** They are used for removal of waste. |
| **iii.** Stomata occur in the epidermis. | **iii.** Lenticels present in the cork surfaces of the stems, roots, and other parts of vascular plants. |
| **iv.** Stoma has guard cells. | **iv.** Lenticel has no guard cells. |

**OR**

**1)** Stomata (singular stoma) In botany, a stoma (also stomate; plural stomata) is a pore, found in the leaf and stem epidermis that is used for gas exchange.
The pore is formed by a pair of specialized parenchyma cells known as guard cells which are responsible for regulating the size of the opening.
Air containing carbon dioxide enters the plant through these openings where it is used in photosynthesis and respiration.

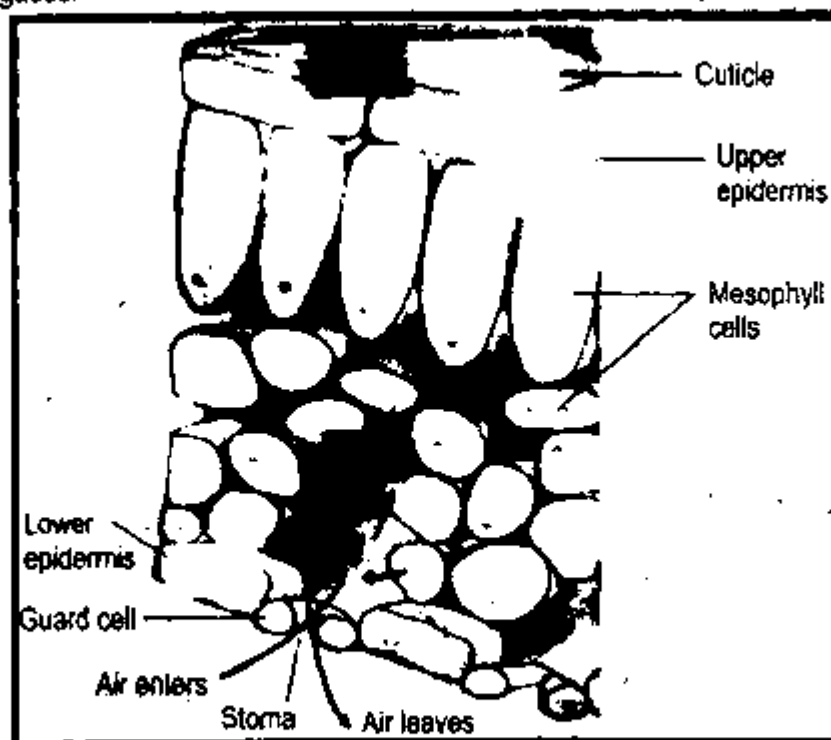
**2)** Lenticel = A lenticel is a spongy area present in the cork surfaces of the stems, roots, and other parts of vascular plants.
It appears on the surface as a lenticular (lens-shaped) spot, which acts as a pore.
These structures allow for the exchange of gases between the internal tissues and atmosphere to occur across the periderm, which would otherwise prevent this exchange of gases.

**iii. How do the different parts of the plant body exchange gases with the environment?**

**Ans: Gaseous exchange in plants:**

Plants have no organs or systems for the exchange of gases with the environment. Every cell of the plant body exchanges gases with the environment by its own.

**Gaseous exchange in stomata:**

The leaves and young stems have **stomata** in their epidermis. The gaseous exchange occurs through these stomata. The inner cells of leaves (mesophyll) and stems also have air spaces among them, which help in the exchange of gases.

**Gaseous exchange in a leaf during daytime:**

During the daytime when the mesophyll cells of leaves are carrying out photosynthesis and respiration side by side, the oxygen produced in photosynthesis is utilized in cellular respiration. Similarly the carbon dioxide produced during cellular respiration is utilized in photosynthesis.

**Gaseous exchange in a leaf during night:**

However, during night when there is no photosynthesis occurring, the leaf cells get oxygen from the environment and release carbon dioxide through stomata.

**Gaseous exchange in stems and roots:**

**Lenticels:**

In woody stems and mature roots, the entire surface is covered by bark which is impervious to gases or water. However, there are certain pores in the layer of bark. These are called the **lenticels**

**Note:** The lenticels are slightly more raised than the general surface of the stem.

Gases diffuse in and out of the general surface of the young roots. The gases are found in the soil surrounding the roots.

**Gaseous exchange in aquatic plants:**

The aquatic plants get the oxygen dissolved in water and release carbon dioxide in the water.

**iv. Write down the steps of inhalation and exhalation.**

**Ans: The Mechanism of Breathing:**

The physical movements associated with the gaseous exchange are called breathing. There are two phases of breathing i.e. inhalation and exhalation.

Inhalation is a process where you intake oxygen through the nostrils and exhalation is breathing out carbon dioxide through the same airways.

**i. Steps of Inspiration or Inhalation:**

During inspiration, the rib muscles contract and ribs are raised. At the same time the dome-shaped diaphragm contracts and is lowered. These movements increase the area of the thoracic cavity, which reduces the pressure on lungs. As a result, the lungs expand and the air pressure within them also decreases. The air from outside rushes into the lungs to equalize the pressure on both sides.

**ii. Steps of Expiration or Exhalation:**

After the gaseous exchange in the lungs, the impure air is expelled out in exhalation. The rib muscles relax bringing the ribs back to the original position. The diaphragm muscles also relax and it gets its raised dome shape. This reduces the space in the chest cavity and increases the pressure on lungs. The lungs contract and the air are expelled out of them.

**Comparison between the inspired and the expired air**

| Feature | Inspired Air | Expired Air |
|---|---|---|
| Amount of oxygen | 21% | 16% |
| Amount of carbon dioxide | 0.04% | 4% |
| Amount of nitrogen | 79% | 79% |
| Amount of water vapours | Variable | Saturated |
| Amount of dust particles | Variable | Almost none |
| Temperature | Variable | Almost equal to body temperature |

**v. Briefly describe human breathe rate per minute in different circumstances.**

**Ans: Human breathe rate during normal circumstances:**

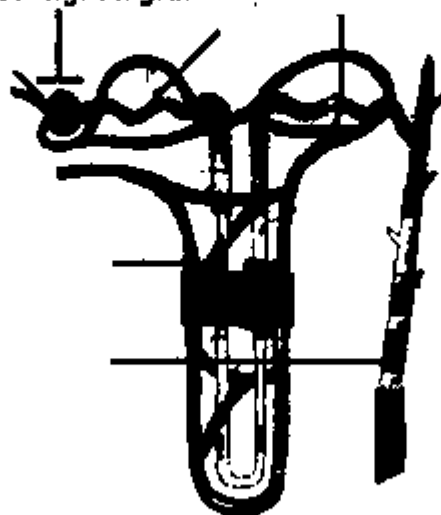
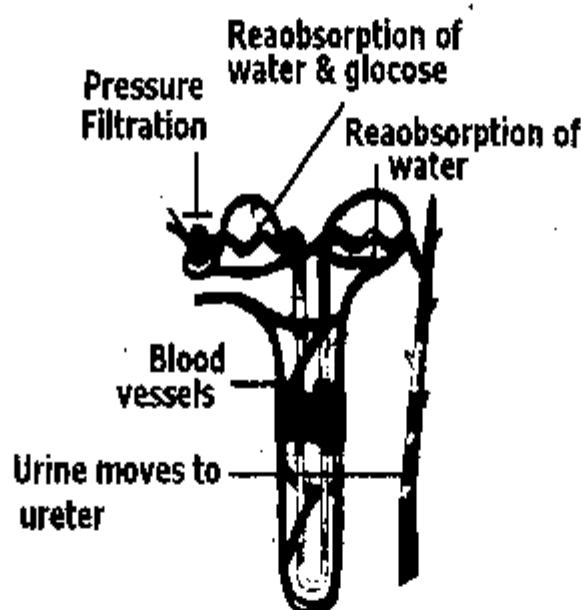
Humans breathe 16-20 times per minute in normal circumstances i.e. at rest. The rate of breathing is controlled by the respiratory centre in the brain. The respiratory centre is sensitive to the concentration of carbon dioxide in the blood.

**Human breathe rate during exercise:**

When we do exercise or some hard job our muscle cells carry out cellular respiration at greater rate. It results in the production of more carbon dioxide which is released in the blood. This greater than normal concentration of carbon dioxide stimulates the respiratory centre of brain. The respiratory centre sends

During exercise or other hard physical works the breathing rate may increase up to 30-40 times per minute.

**Note:** The breathing movements are involuntary to a large extent. However, we can control the rate of breathing but not for a long time.

**vi. Identify and label the following: diagram.**

**Ans:**

**vii. Describe the process of selective re-absorption in the kidneys.**

**Ans:** In this step about 99% of the glomerular filtrate is reabsorbed into the blood capillaries surrounding renal tubule. It occurs through osmosis, diffusion and active transport.

Some water and most of the glucose is reabsorbed from the proximal convoluted tubule. Here, salts are reabsorbed by active transport and then water follows by osmosis

The descending limb of loop of Henle allows the reabsorption of water while the ascending limb of Loop of Henle allows the reabsorption of salts. The distal convoluted tubule again allows the reabsorption of water into the blood.

**viii. What is the functional unit of the kidney? Describe its structure and draw labeled diagram.**

**Ans: Nephron:**

The functional unit of the kidneys is called nephron. There are over one million nephrons in each kidney.

**Parts of nephron:**

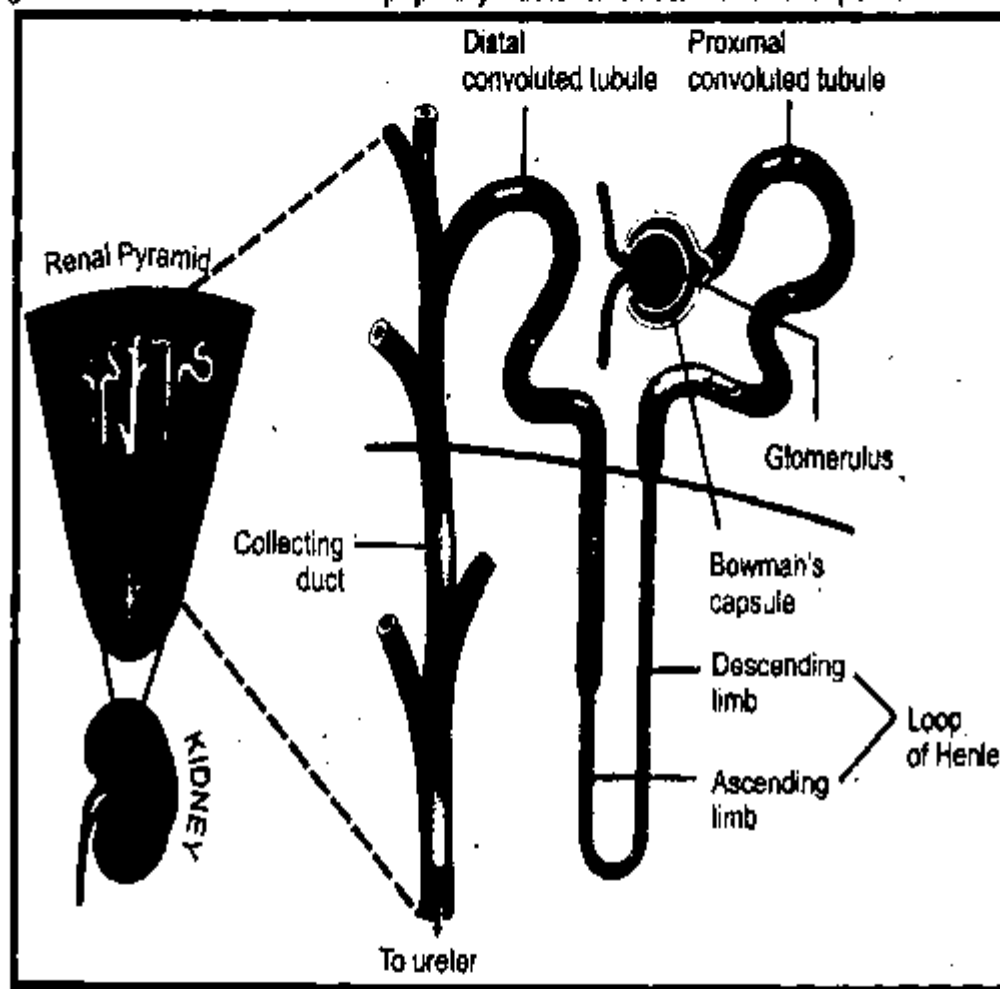
There are two parts of a nephron i.e. renal corpuscle and renal tubule.

**i. renal corpuscle:**

The capillaries of the glomerulus arise from the afferent arteriole and join to form the efferent arteriole.

**ii. Renal tubule:**

The **renal tubule** is the part of nephron which starts after Bowman's capsule. Its first portion is called the **proximal convoluted tubule.** Next portion is U-shaped and is called the **Loop of Henle.** The last portion of renal tubule is the **distal convoluted tubule.**

The distal convoluted tubules of many nephrons open in a single **collecting duct.** Many collecting ducts join together to form several hundred **papillary ducts** which drain into renal pelvis.

Structure of a nephron

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)**

**i. What steps are involved in the formation of urine in the kidneys?**

**Ans: Functioning of Kidney:**

The main function of kidney is urine formation, which takes place in three steps.

**Formation of urine:**

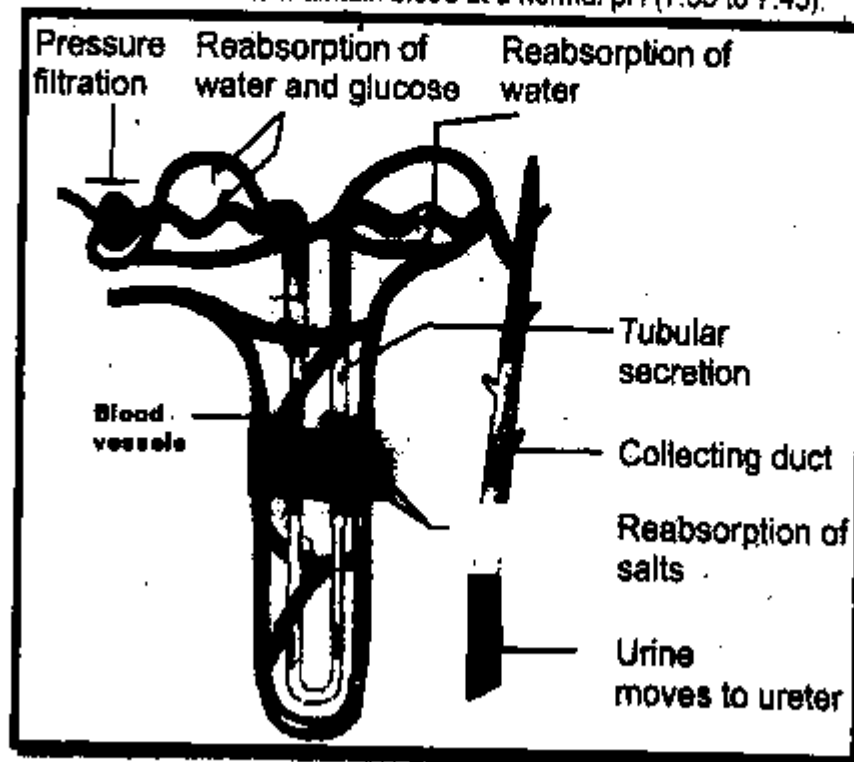
**I. Pressure filtration:**

The first step is **pressure filtration.** When blood enters the kidney via the renal artery, it goes to many arterioles, and then to the glomerulus. The pressure of blood is very high and so most of the water, salts, glucose and urea of blood is forced out of glomerular capillaries. This material passes into the Bowman's capsule and is now called **glomerular filtrate.**

**ii. Selective re-absorption:**

The second step is the **selective re-absorption.** In this step about 99% of the glomerular filtrate is reabsorbed into the blood capillaries surrounding renal tubule. It occurs through osmosis, diffusion and active transport. Some water and most of the glucose is reabsorbed from the proximal convoluted tubule. Here, salts

iii. **Tubular secretion:**

The third step is the **tubular secretion.** Different ions, creatinine, urea etc. are secreted from blood into the filtrate in renal tubule. This is done to maintain blood at a normal pH (7.35 to 7.45).

**Functioning of Kidney (nephron)**

**Urine:** After the above mentioned steps, the filtrate present in renal tubules is known as **urine.** It moves into collecting ducts and then into pelvis.

ii. **Write a note on halophytes.**

**Ans: Halophytes:**

Halophytes live in sea waters and are adapted to salty environments. Salts enter in the bodies of such plants due to their higher concentration in sea water. On the other hand, water tends to move out of their cells into the hypertonic sea water. When salts enter into cells, plants carry out active transport to move and hold large amount of salts in vacuoles.

Salts are not allowed to move out through the semi-permeable membranes of vacuoles. So the sap of vacuoles remains even more hypertonic than sea water. In this way, water does not move out of cells. Many sea grasses are included in this group of plants.

iii. **Enlist the normal chemical composition of urine?**

**Ans: Normal chemical composition of urine:**

| Normal chemical composition of urine (Source: NASA Contractor Report) | |
|---|---|
| Water | 95% |
| Urea | 9.3 $g/l$ |
| Chloride ions | 1.87 $g/l$ |
| Sodium ions | 1.17 $g/l$ |
| Potassium ions | 0.750 $g/l$ |
| Other ions and compounds | Variable amounts |

iv. **"Along with excretion, kidneys also play role in Osmoregulation." Comment on this statement.**

**Ans: Osmoregulatory:**

**Osmoregulation** is defined as the regulation of the concentration of water and salts in blood and other body fluids.

**Dilute (hypotonic) urine:**

When there is excess water in body fluids, kidneys form dilute (hypotonic) urine. For this purpose, kidneys filter more water from glomerular capillaries into Bowman's capsule. Similarly less water is reabsorbed and abundant dilute urine is produced. It brings down the volume of body fluids to normal.

**Concentrated (hypertonic) urine:**

When there is shortage of water in body fluids, kidneys filter less water from glomerular capillaries and the rate of reabsorption of water is increased. Less filtration and more reabsorption produce small amount of concentrated (**hypertonic**) urine. It increases the volume of body fluids to normal. This whole process is under hormonal control.

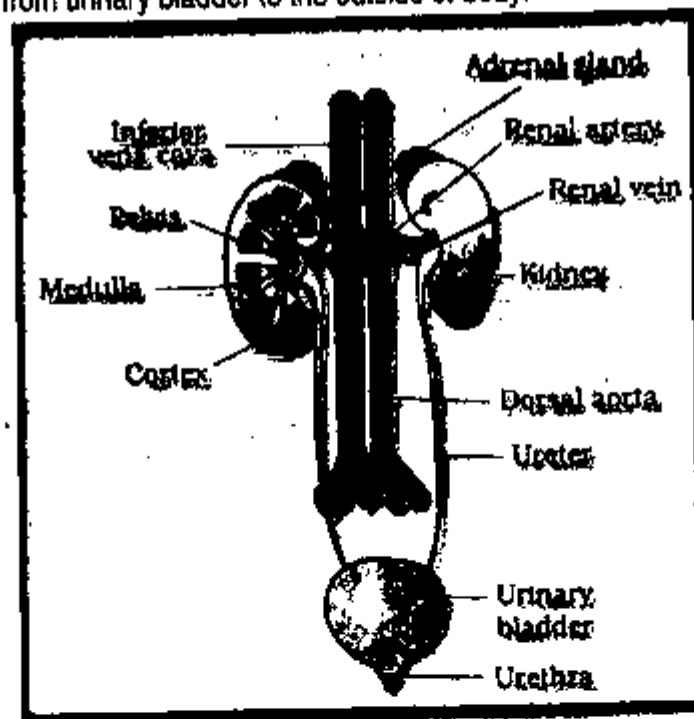
***OR (Second answer)***

Osmoregulation is the process which regulates the concentration and osmotic pressure of blood by regulating the water contents of blood plasma. It is an important process as excessive loss of water may cause dehydration whereas excess of water intake may dilute the body fluids.

The vertebrate kidney is extremely flexible in its working. It excretes large amount of hypotonic urine when water intake is very high, while it excretes small amount of hypertonic urine when water is deficient and needs to be conserved.

**v. The urinary system of humans is the major organ involved in homeostasis in human body state the role of the urinary system of humans in homeostasis?**

**Ans: The Urinary System of Humans:**

The excretory system of humans is also called the urinary system. It is formed of one pair of kidneys, a pair of ureters, a urinary bladder and a urethra. Kidneys filter blood to produce urine and the ureters carry urine from kidneys to urinary bladder. The bladder temporarily stores urine until it is released from body. Urethra is the tube that carries urine from urinary bladder to the outside of body.

The Urinary System of Humans

**vi. Define the following terms.**

**a. Nasal cavity** **b. Nostril** **c. Alveolar duct**

**Ans: a. Nasal cavity:**

Hollow space in the nose; opens to the outside through nostrils; divided into two portions by a wall.

**b. Nostril:**

The openings of the nasal cavity called nostrils.

**vii. Define the following terms.**

a. **Papillary ducts** b. **Peritoneal dialysis** c. **Pressure filtration**

**Ans: a. Papillary ducts:**

The ducts formed by the joining of many collecting ducts; open into renal pelvis.

**b. Peritoneal dialysis:**

The dialysis in which the dialysis fluid is pumped into the abdominal peritoneal cavity; the wastes from the blood vessels of the peritoneum diffuse into the dialysis fluid which is then drained out.

**c. Pressure filtration:**

The first step in urine formation; the process in which most of the water, salts, glucose and urea of the blood is forced out of the glomerulus and passed into Bowman's capsule

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks.**

**(2 ×10 = 20)**

**Q4. a. How do the different parts of humans body exchange gases with the environment?**

**Ans: Gaseous Change in Humans:**

In humans and other higher animals the exchange of gases is carried out by the respiratory system. We can divide the respiratory system in two parts i.e.

i. The air passageway ii The lungs

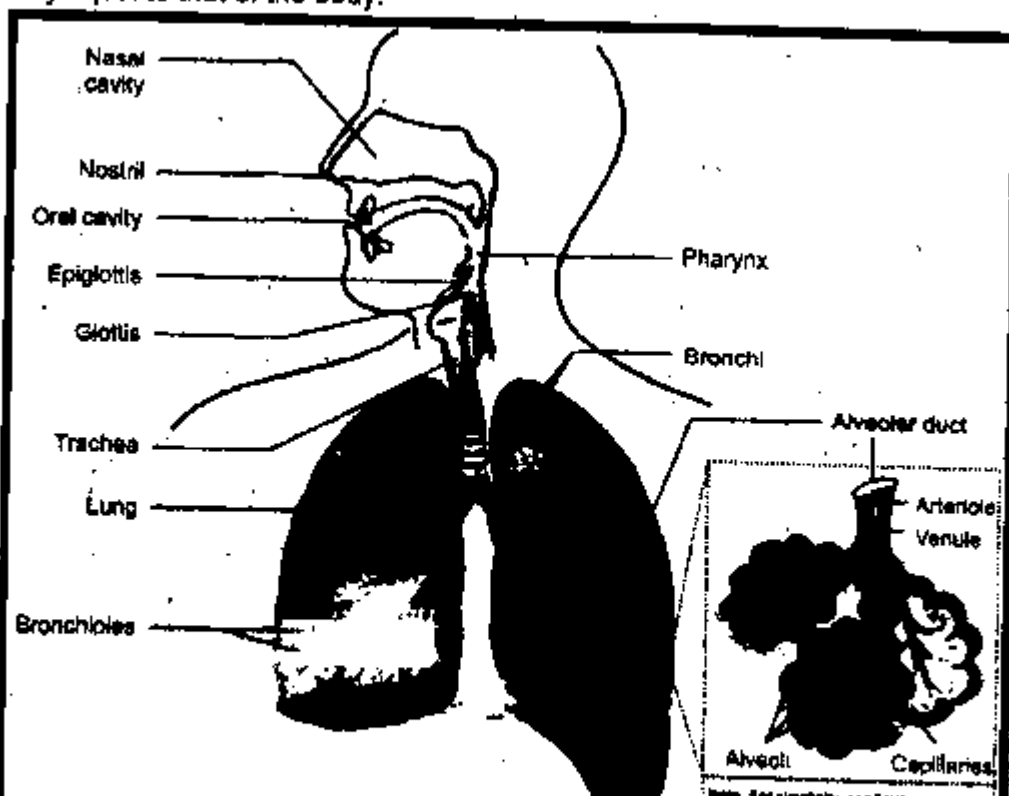
**i. The Air Passageway:**

The air passageway consists of the parts through which the outside air comes in the lungs and after the exchange of gases it goes out.

**Parts of the air passageway:**

This passage of air consists of the following parts.

**Nasal cavity:**

The nose encloses the **nasal cavity**. It opens to the outside through the openings called the **nostrils**. The nasal cavity is divided into two portions by a wall. Each portion is lined by fine hairs and mucous which filter the dust particles from the air. The mucous also moistens and warms the incoming air and keeps its temperature nearly equal to that of the body.

**Pharynx:**

The nasal cavity opens into the **pharynx** by means of two small openings called internal nostrils. Pharynx is a muscular passage and is common to both food and air. It extends to the opening of the oesophagus and the larynx. The air goes from the pharynx into the larynx.

**Glottis:**

**Glottis** is a narrow opening at the floor of pharynx which leads into larynx. The glottis is guarded by a flap of tissue called the epiglottis.

**Larynx (voice box):**

The larynx is a box, **made of cartilage. It is** present between pharynx and trachea. It is also called the **voice box.** Two pairs of fibrous **bands called** vocal **cords** are stretched across the larynx.

**Function of vocal cords:**

The vocal cords vibrate when the air passes through them. This vibration produces sounds.

**Trachea (windpipe):**

Larynx continues to the **trachea,** which is also called the windpipe. It is about 12 cm long tube which lies in front of the oesophagus. There are C-shaped cartilagenous rings in the wall of trachea. The cartilages keep the trachea from collapsing even when there is no air in it.

**Bronchi:**

On entering the chest cavity, the trachea divides into two smaller tubes called **bronchi** (Singular: bronchus). The bronchi also have cartilagenous plates in their walls. Each bronchus enters into the lung of its side and then divides into smaller branches.

The bronchi continue dividing in the lungs until they make several fine tubes called **bronchioles.**

**Alveolar ducts:**

The bronchioles progressively lose the cartilages as they become narrower, the bronchioles end as fine tubules called the alveolar ducts.

**Alveoli:**

Each alveolar duct opens into a cluster of pouches called alveoli. The alveoli form the respiratory surface in human body. Each alveolus is a sac-like structure lined by a single layer of epithelial cells. It is bound on the outside by a network of capillaries.

**The pulmonary artery:**

The pulmonary artery from the heart containing deoxygenated blood enters the lungs and branches into arterioles and then into capillaries which surround the alveoli. These then join together to form the venules which form pulmonary vein. The pulmonary vein carries the oxygenated blood back to the heart.

**ii. The Lungs:**

All the alveoli on one side constitute a lung. There is a pair of lungs in the thoracic cavity.

**Intercoastal muscles:**

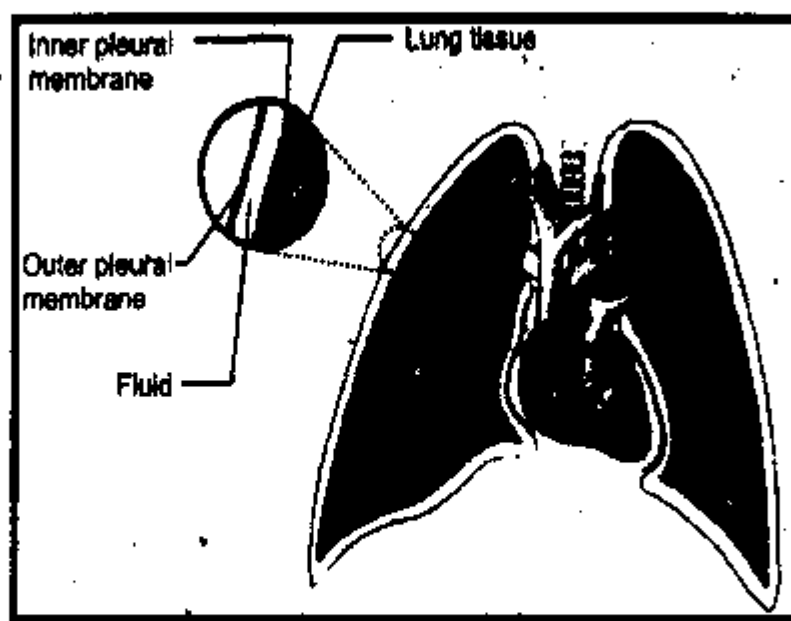
The chest wall is made up of 12 pairs of **ribs** and the rib muscles called **intercoastal muscles.**

**Diaphragm:**

A thick muscular structure, called **diaphragm,** is present below the lungs.

The left lung is slightly smaller and has two lobes and the right lung is bigger with three lobes. They are spongy and elastic organs. The lungs also have blood vessels that are the branches of the pulmonary arteries and veins.

**Function of membranes in the lungs:**

Each lung is enclosed by two membranes called the outer pleural membrane and the inner pleural membrane. The membranes enclose a fluid which provides lubrication for the free expanding and contracting of the lungs.

Lungs and pleural membranes

**b. Describe the process of osmotic adjustments in plants?**

**Ans: Osmotic Adjustments in Plants:**

**Osmosis:**

Osmosis is the movement of water from hypotonic solutions (less solute concentration), to hypertonic solutions (higher solute concentration), through semi permeable membrane.

On the basis of the available amount of water and salts, plants are divided into three groups.

**i. Hydrophytes:**

Hydrophytes are the plants which live completely or partially submerged in freshwater. Such plants do not face the problem of water shortage. They have developed mechanisms for the removal of extra water from their cells.

Hydrophytes have broad leaves with a large number of stomata on their upper surfaces. This characteristic helps them to remove the extra amount of water. The most common example of such plants is water lily.

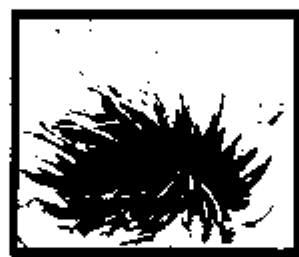
Hydrophytes

**ii. Xerophytes:**

Xerophytes live in dry environments. They possess thick, waxy cuticle over their epidermis to reduce water loss from internal tissues. They have less number of stomata to reduce the rate of transpiration. Such plant have deep roots to absorb maximum water from soil.

Some xerophytes have special parenchyma cells in stems or roots in which they store large quantities of water. This makes their stems or roots wet and juicy, called **succulent organs.** Cacti (Singular: Cactus) are the common examples of such plants.

**iii. Halophytes:**

Halophytes live in sea waters and are adapted to salty environments. Salts enter in the bodies of such plants due to their higher concentration in sea water. On the other hand, water tends to move out of their cells into the hypertonic sea water. When salts enter into cells, plants carry out active transport to move and hold large amount of salts in vacuoles.

Halophytes

Salts are not allowed to move out through the semi-permeable membranes of vacuoles. So the sap of vacuoles remains even more hypertonic than sea water. In this way, water does not move out of cells. Many sea grasses are included in this group of plants.

**Q5. Describe the structure and labelled diagram of kidney?**

**Ans: Structure of Kidney:**

**Colour, shape, size and weight of kidney:**

Kidneys are dark-red, bean shaped organs. Each kidney is 10 cm long, 5 cm wide and 4 cm thick and weighs about 27 grams.

**Location of kidneys:**

Kidneys are placed against the back wall of abdominal cavity just below diaphragm, one on either side of vertebral column. They are protected by the last 2 ribs. The left kidney is a little higher than the right.

**Hilus:** The concave side of kidney faces vertebral column. There is a depression, called hilus, near the centre of the concave area of kidney. This is the area of kidney through which ureter leaves kidney and other structures including blood vessels, lymphatic vessels and nerves enter and leave kidney.

**Longitudinal section of the kidney:** The longitudinal section of the kidney shows two regions.

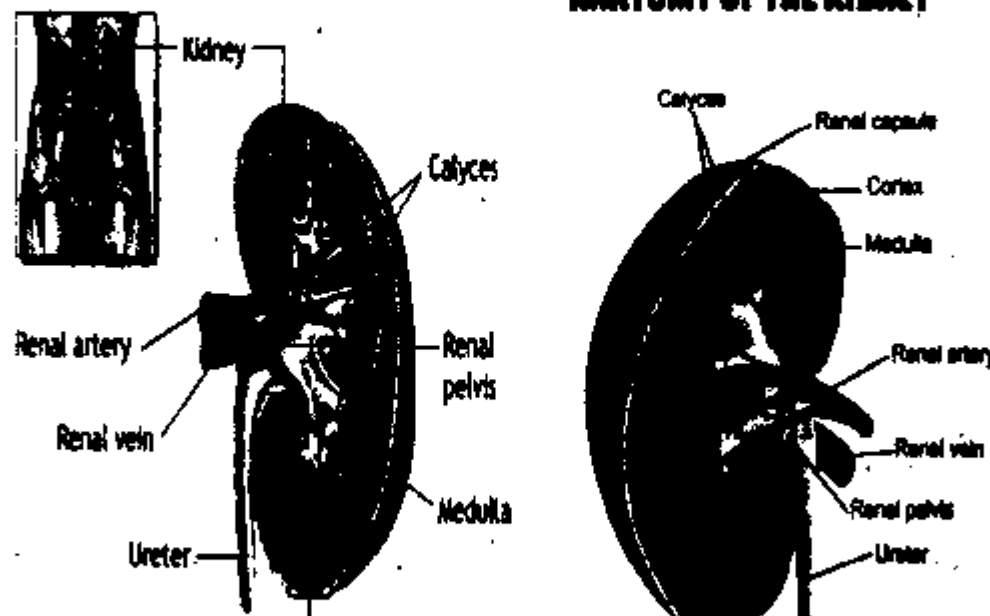
**Renal Cortex:** Renal cortex is the outer part of kidney and it is dark red in colour.

**Renal medulla:** Renal medulla is the inner part of kidney and is pale red in colour.

**Pyramids:** Renal medulla consists of several cone shaped areas called renal pyramids.

**Renal pelvis:**

Renal pyramids project into a funnel-shaped cavity called renal pelvis, which is the base of ureter.

ANATOMY OF THE KIDNEY

**Nephron:**

The functional unit of the kidneys is called **nephron**. There are over one million nephrons in each kidney.

**Parts of nephron:** There are two parts of a nephron i.e. renal corpuscle and renal tubule.

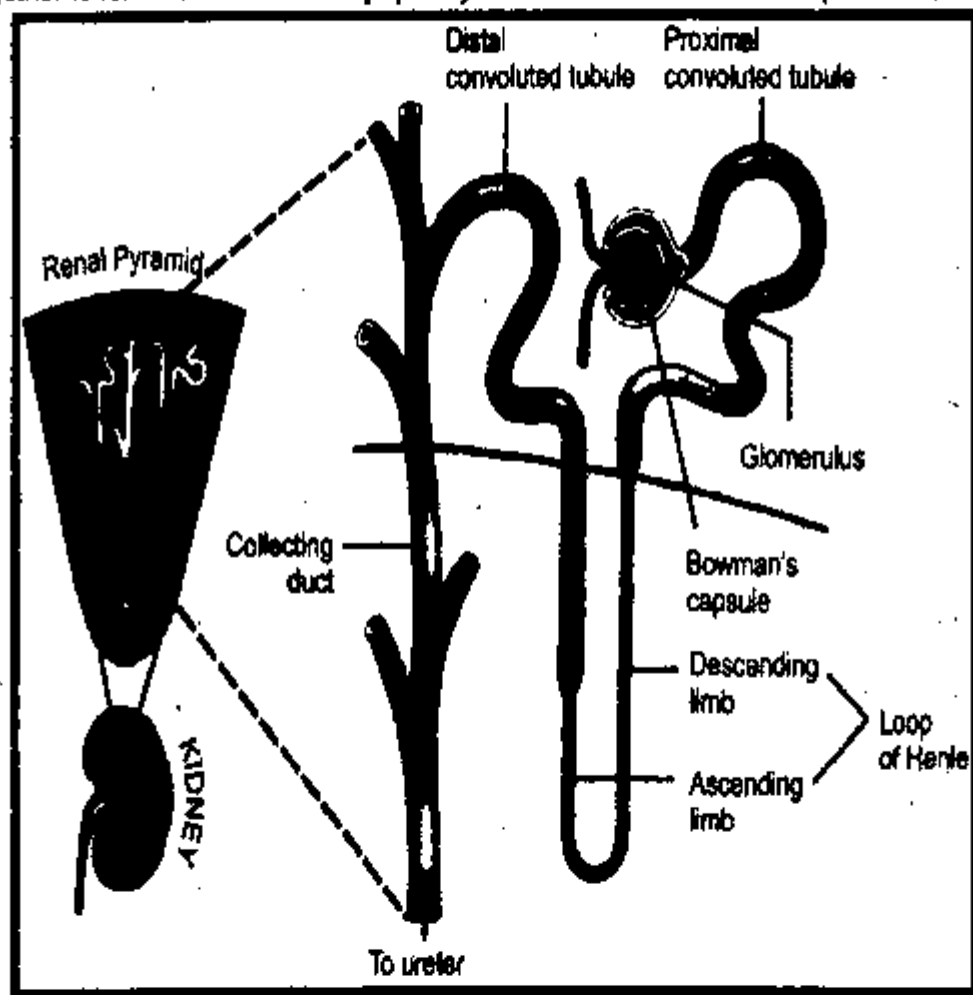
**i. renal corpuscle:**

The **renal corpuscle** is not tubular and has two parts i.e. glomerulus and Bowman's capsule. **Glomerulus** is a network of capillaries while **Bowman's capsule** is a cup-shaped structure that encloses glomerulus.

The capillaries of the glomerulus arise from the afferent arteriole and join to form the efferent arteriole.

**ii. Renal tubule:**

The **renal tubule** is the part of nephron which starts after Bowman's capsule. Its first portion is called the **proximal convoluted tubule.** Next portion is U-shaped and is called the **Loop of Henle**. The last portion of renal tubule is the **distal convoluted tubule.**

The distal convoluted tubules of many nephrons open in a single **collecting duct.** Many collecting ducts join together to form several hundred **papillary ducts** which drain into renal pelvis.

Structure of a nephron

**Q6. Explain the different methods of dialysis?**

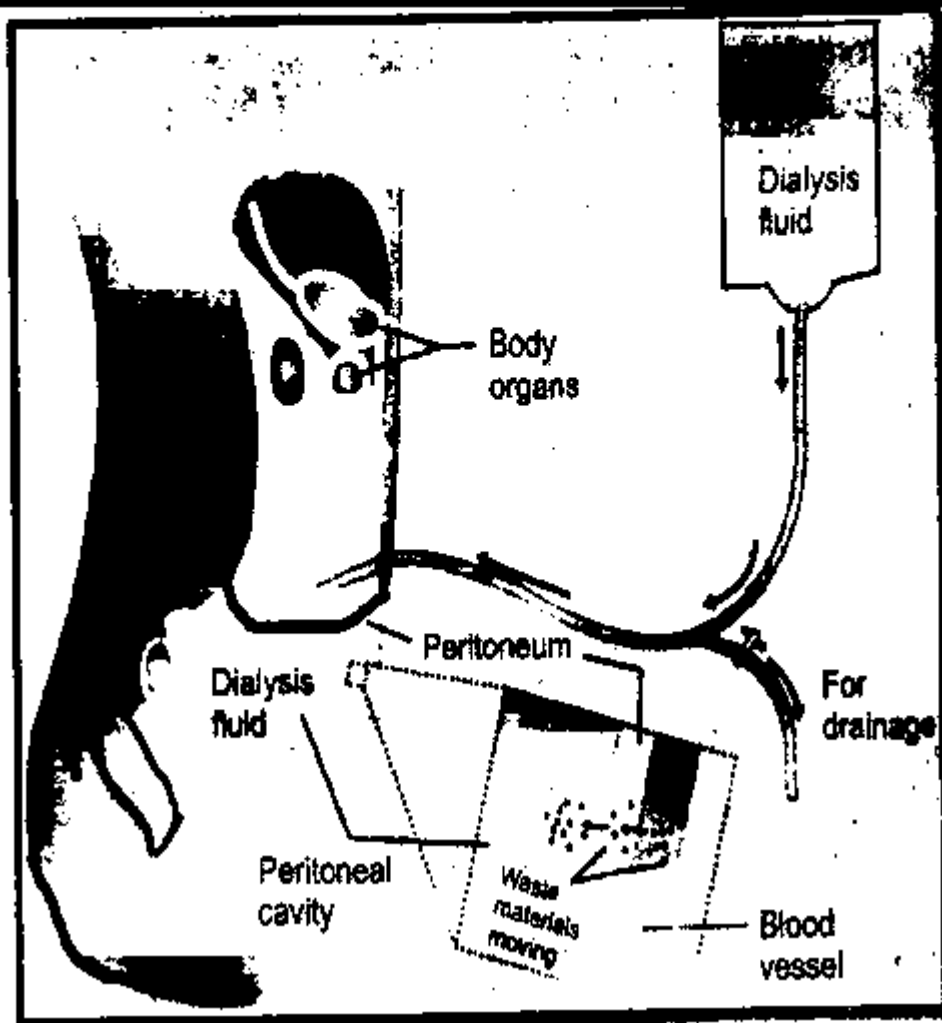
**Ans: Dialysis:**

Dialysis means the cleaning of blood by artificial ways.

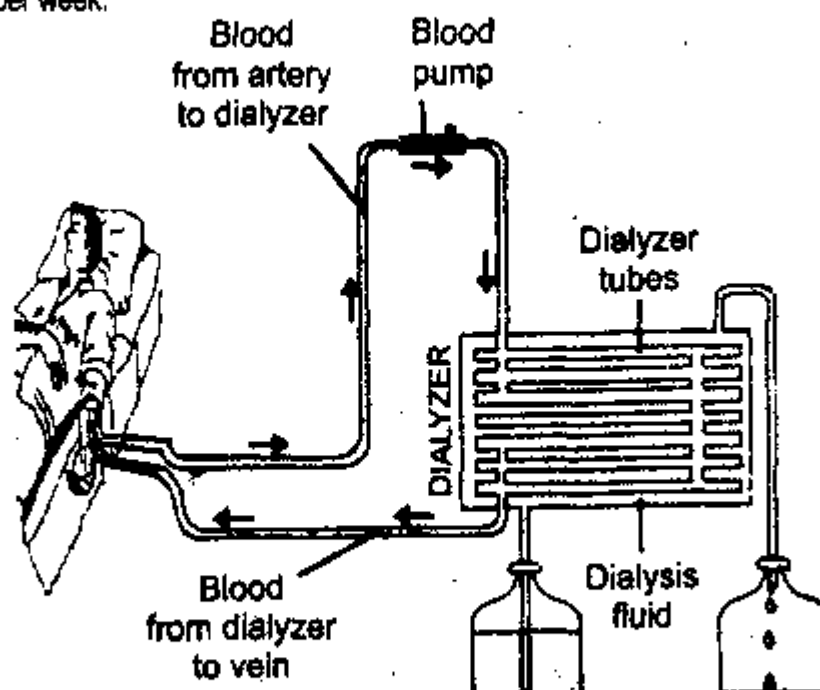
**Methods of dialysis:**

There are two methods of dialysis.

**1. Peritoneal Dialysis:**

In this type of dialysis, the dialysis fluid is pumped for a time into the peritoneal cavity which is the space around gut. This cavity is lined by peritoneum.

Peritoneal Dialysis

**2. Haemodialysis:**

In haemodialysis, patient's blood is pumped through an apparatus called **dialyzer**. The dialyzer contains long tubes, the walls of which act as semi-permeable membranes. Blood flows through the tubes while the dialysis fluid flows around the tubes. Extra water and wastes move from blood into the dialysis fluid. The cleansed blood is then returned back to body. The haemodialysis treatments are typically given in dialysis centres three times per week.

# IMPORTANT MULTIPLE CHOICE

1. **Which is the correct order for the path taken by urine after it leaves the kidneys?**
   A. Urethra, bladder, ureters
   B. Bladder, ureters, urethra
   C. Ureters, bladder, urethra
   D. Bladder, urethra, ureters
2. **What is the function of the ureter?**
   A. To store urine
   B. To carry urine from the kidney to the bladder
   C. To carry urine out of the body
   D. To remove waste from the blood
3. **What waste products are excreted by kidneys?**
   A. Urea, water & salts
   B. Salts, water and carbon dioxide
   C. Urea & water
   D. Urea & salts
4. **The two main functions of sweat are;**
   A. To keep the body cool and to remove excess proteins
   B. To keep the body warm and to filter the blood
   C. To filter the blood and to remove waste products
   D. To remove waste products and to cool the body
5. **Which would NOT be present in the filtrate entering the Bowman's capsule of nephron?**
   A. Water
   B. Calcium ions
   C. Blood cells
   D. Urea
6. **During peritoneal dialysis, the waste materials move from:**
   A. The abdomen to the dialysis fluid
   B. The dialysis fluid to the peritoneum blood vessels
   C. The peritoneum blood vessels to the dialysis fluid
   D. The dialysis fluid to the abdomen

## Answers

| 1. C | 2. B | 3. A | 4. D | 5. C | 6. C |
|---|---|---|---|---|---|

# GUESS PAPER & MODEL PAPER # 2
## BASED ON CHAPTER # 12 (Reduced Syllabus)
# COORDINATION AND CONTROL

**NOTE:**

1. **Only topic based relevant MCQs. Short and Long Questions are included.**
2. **All information in side boxes is excluded.**

| Chapter Name | Topics Included |
|---|---|
| Coordination and Control (Chapter # 12) | Types of Coordination (Coordination Action Excluded) (33)<br>Human Nervous System (34-41)<br>Receptors in Humans Eye (42-43)<br>Ear (45-16)<br>Endocrine System (47-51) |

## SECTION – A (Marks 12)

**Time allowed: 20 Minutes** **Marks: 12**

NOTE:- Section-A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

**Q1. Circle the correct option i.e. A / B / C / D. Each part carries one mark.**

**i. Processes that carry nerve impulses away from the cell body are called:**
A. Axons B. Dendrites C. Synapses D. Myelin sheath

**ii. The portion of the nervous system that is involuntary in action:**
A. Somatic nervous system B. Motor nervous system
C. Autonomic nervous system D. Sensory nervous system

**iii. Which neurons are present inside the central nervous system?**
A. Sensory neurons only B. Motor neurons only
C. Sensory and motor neurons both D. Interneurons only

**iv. The part of the brain responsible for muscle movement, interpretation of the senses and the memory is the;**
A. Pons B. Medulla oblongata
C. Cerebrum D. Cerebellum

**v. Apart from hearing, what other major body function is performed by the ear?**
A. Hormone secretion B. Body balance
C. Reduction in nerve pressure D. All of these

**vi. The myelin sheath is formed by_______ which wrap around the axons of some neurons.**
A. Nodes of Ranvier B. Axons C. Dendrites D. Schwann cells

**vii. This is NOT a part of the hindbrain:**
A. Pons B. Medulla oblongata C. Cerebrum D. Cerebellum

**viii. If you look at an intact human brain, what you see the most is a large, highly convoluted outer surface. This is the;**
A. Cerebrum B. Cerebellum C. Pons D. Medulla oblongata

**ix. Insulin and glucagon are produced in the;**
A. Hypothalamus B. Anterior pituitary C. Liver D. Pancreas

**x. All of these are hormones except:**
A. Insulin B. Thyroxin C. Glucagon D. Pepsinogen

xii. In a human eye there are about ______ lakhs rods and ______ lakhs cones.
A. 123, 6 B. 124, 8 C. 125, 7 D. 122, 4

# BIOLOGY SSC-II

**Time allowed: 2:40 Hours** **Total Marks: 53**

NOTE: Answer any six parts from Section 'B' and attempt any five parts from Section-C. Attempt any two questions from Section 'D' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

## SECTION-B (Marks 18)

**Q.2** Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)

i. Identify the two types of coordination in living organisms.
ii. Define reflex action and reflex arc.
iii. Trace the path of a nerve impulse in case of a reflex action.
iv. Describe the pupil reflex in dim and bright light.
v. How would you associate the role of vitamin A with vision and effects of its deficiency on retina?
vi. Define the terms; hormone and endocrine system.
vii. How would you associate the role of human nervous system?
viii. Define nerve and describe the different types of nerve?

## SECTION – C (Marks 15)

**Q.3** Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)

i. Describe negative feedback with reference to insulin and glucagon.
ii. Explain how adrenaline may be involved in exercise and emergency conditions?
iii. Justify the difference between night blindness and colour blindness.
iv. How would you describe the Endocrine System?
v. What is the function of hormones in the stepwise process of metamorphosis in many animals?
vi. Outline the Parathyroid glands of the endocrine system with name of its hormones and their functions.
vii. Briefly explain Feedback Mechanisms and its types.

## SECTION – D (Marks 20)

**Note:** Attempt any TWO questions from the following. All questions carry equal marks. (2 ×10 = 20)

**Q4.** a. Explain the location and function of these parts of brain; cerebrum, cerebellum, pituitary gland, thalamus, hypothalamus, medulla oblongata.
b. Define neuron and describe the structure of a general neuron.

**Q5.** a. Describe the structure of human eye.
b. How would you describe the structure of the external, middle and inner ear of man?

**Q6.** Outline the major glands of the endocrine system (pituitary, thyroid, pancreas, adrenal, gonads), with name of their hormones and their functions.

# SOLUTION OF GUESS PAPER & MODEL PAPER # 2

## SECTION- A (MCQs)

| i. A | ii. C | iii. B | iv. C | v. B | vi. D |
|---|---|---|---|---|---|

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)**

**i. Identify the two types of coordination in living organisms.**

**Ans: Types of Coordination:**

There are two types of coordination in organisms:

i. Nervous coordination brought about by nervous system and

ii. Chemical coordination about by endocrine system.

**ii. Define reflex action and reflex arc.**

**Ans: Reflex action:**

The involuntary and immediate response to a stimulus is called reflex action. A reflex action, also known as a reflex, is an involuntary and nearly instantaneous movement in response to a stimulus.

**Reflex arc:** The nerve pathway over which the nerve impulses travel in a reflex action.

A reflex arc is a neural pathway that controls an action reflex.

There are two types of reflex arc:

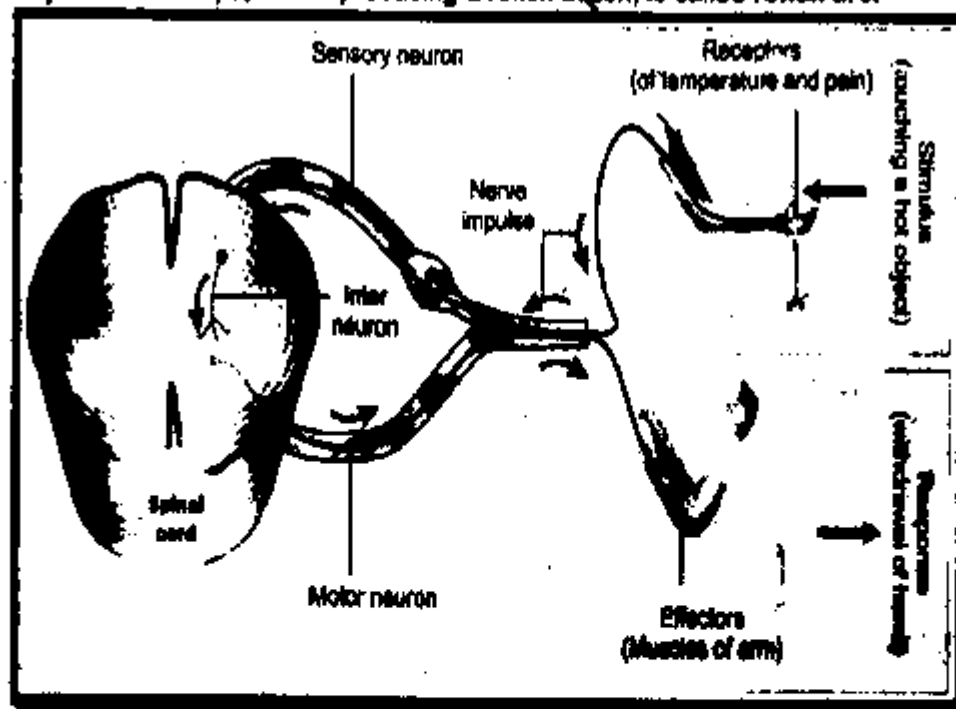
a. Autonomic reflex arc (affecting inner organs).

b. Somatic reflex arc (affecting muscles).

**iii. Trace the path of a nerve impulse in case of a reflex action.**

**Ans: Path of a nerve impulse:**

When central nervous system sends impulses to muscles and glands, two types of actions (responses) result.

1. The higher centres of brain control the conscious action or voluntary actions.
2. When impulses are not passed to the higher centres of brain, it results in responses which are not under conscious control. Such responses are called involuntary actions. Sometimes, the involuntary response produced by the CNS is very quick. Such a response is called reflex action. The pathway followed by the nerve impulses for producing a reflex action, is called reflex arc.

Reflex arc in a reflex action

**iv. Describe the pupil reflex in dim and bright light.**

**Ans:** There is round hole in the eye, called pupil, in the centre of iris. After striking the cornea, light passes through the pupil. The size of pupil is adjusted by the muscles of iris.

**Pupil reflex in bright light:**

**v. How would you associate the role of vitamin A with vision and effects of its deficiency on retina?**

**Ans:** Rods contain a pigment called **rhodopsin.** When light falls on rhodopsin, it breaks for generating a nerve impulse. In the absence of light, the breakdown products are again converted into rhodopsin. Body **synthesizes** rhodopsin from **vitamin A** and that is why the deficiency of vitamin A causes poor night vision. This problem is called **night blindness.**

**vi. Define the terms; hormone and endocrine system.**

**Ans: Hormone:**

A substance that is secreted by an endocrine gland directly into blood and that produces a specific effect on a particular tissue is called hormone. Blood carries the hormones to target organs or tissues, upon which they act

**Endocrine System:**

The bodily system that consists of the endocrine glands that release their secretions (hormones) into the bloodstream to reach and act on target cells of specific organs.

The activities such as growth, reproduction, maintenance of glucose concentration in blood, reabsorption of water in kidneys etc. need to be regulated. Endocrine system performs this job. This system uses chemicals to "communicate" with its effectors. These chemicals are known as hormones.

**vii. How would you associate the role of human nervous system?**

**Ans: Human nervous System:**

The nervous system in man and in other higher animals is composed of two major components i.e. central nervous system and peripheral nervous system.

**I. Central nervous system:**
Central nervous system comprises of coordinators i.e. brain and spinal cord.

**II. Peripheral nervous system:**
Peripheral nervous system consists of nerves that arise from central nervous system and spread in different parts of body. All these components are made of neurons.

**viii. Define nerve and describe the different types of nerve?**

**Ans: Nerve:** A nerve means the union of several axons that are enveloped by a covering made of lipid.

**Types of nerve:** Based on the property of axons, the nerves are classified into three types.

i. **Sensory nerves:** Sensory nerves contain the axons of sensory neurons only.
ii. **Motor nerves:** Motor nerves contain the axons of motor neurons only.
iii. **Mixed nerves:** Mixed nerves contain the axons of both i.e. sensory and motor neurons.

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks.** **(5 × 3 = 15)**

**I. Describe negative feedback with reference to insulin and glucagon.**

**Ans: Negative Feedback of Insulin and Glucagon:**

In negative feedback, the output of a process decreases or inhibits the process. This mechanism works to return a condition towards its normal value.

**Example:**

When the blood glucose concentration rises, pancreas secretes insulin. It decreases the blood glucose concentration. Decline in the blood glucose concentration to a normal set-point inhibits the secretion of insulin. Similarly, when blood glucose concentration drops below normal, pancreas secretes glucagon. It raises the blood glucose concentration. In this case, rise in the blood glucose concentration to a normal set-point inhibits the secretion of glucagon. In other words, the blood glucose concentration (output) controls the process i.e. the secretion of insulin and glucagon.

**ii. Explain how adrenaline may be involved in exercise and emergency conditions?**

**Ans:** The outer part is cortex and the inner part is medulla. Adrenal medulla secretes a hormone called

**iii. Justify the difference between night blindness and colour blindness.**

**Ans: Night Blindness:**

Body synthesizes rhodopsin from **vitamin A** and that is why the deficiency of vitamin A causes poor night vision. This problem is called night blindness.

Cones also contain a pigment, known as **Iodopsin.** There are three main types of cones and each type has a specific iodopsin. Each type of cones recognizes one of the three primary colours i.e. blue, green and red.

**Colour Blindness:**

If any type of cones is not working well, it becomes difficult to recognize that colour. Such person is also not able to distinguish different colours. This disease is called **colour blindness.** It is a genetic problem.

**iv. How would you describe the Endocrine System?**

**Ans: Endocrine System:**

The system of glands that produce endocrine secretions that help to control bodily metabolic activity.

The endocrine system is the system of glands, each of which secretes different types of hormones directly into the bloodstream (some of which are transported along nerve tracts[citation needed]) to regulate the body. The endocrine system is in contrast to the exocrine system, which secretes its chemicals using ducts. The word endocrine derives from the Greek words "endo" meaning inside, within, and "crinis" for secrete.

**Functions of endocrine system:**

The activities such as growth, reproduction, maintenance of glucose concentration in blood, re-absorption of water in kidneys etc. need to be regulated. Endocrine system performs this job. This system uses chemicals to "communicate" with its effectors. These chemicals are known as hormones. A hormone is a specific messenger molecule synthesized and secreted by an endocrine gland. These glands are ductless and release their secretions (hormones) directly into bloodstream. Blood carries the hormones to target organs or tissues, upon which they act.

**Exocrine Glands:**

Many glands in our body are exocrine. Such glands have ducts for releasing their secretions e.g. digestive glands, skin glands etc.

**v. What is the function of hormones in the stepwise process of metamorphosis in many animals?**

**Ans: Function of Hormones:**

The stepwise process of metamorphosis in many animals is controlled by hormones. Life activities such as cell division in invertebrates are also regulated by hormones. Hormones also control activities like migration in birds. Hormones have been identified even in unicellular organism.

**vi. Outline the Parathyroid glands of the endocrine system with name of its hormones and their functions.**

**Ans: Parathyroid glands:**

These are four glands situated on the posterior side of thyroid gland. They produce a hormone known as parathormone.

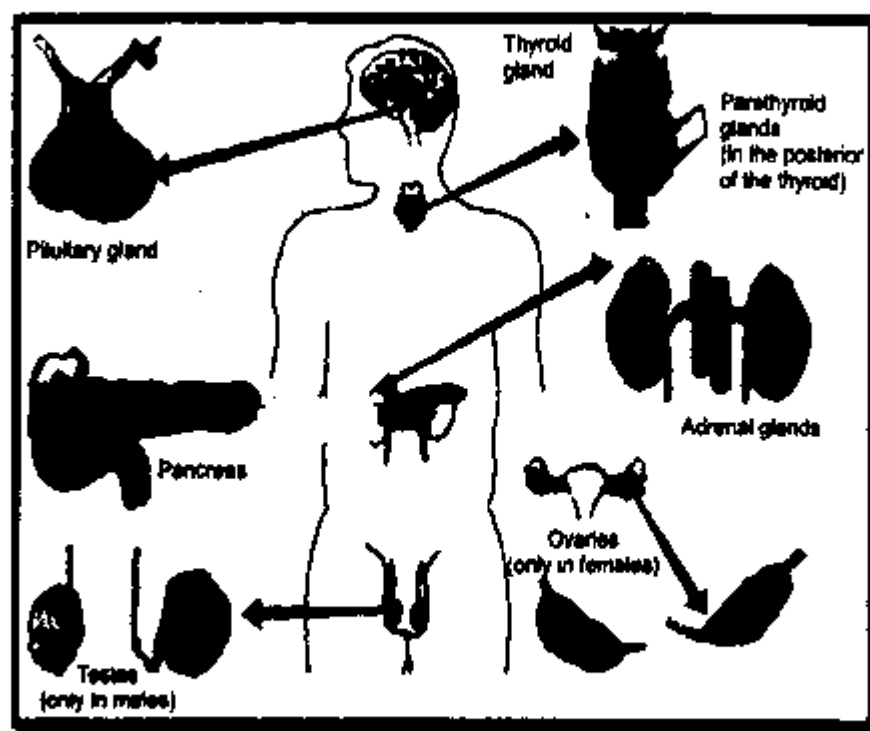
**Function of Parathormone:**

It increases the level of calcium ions in the blood. When there is increased production of parathormone, more than normal calcium, consequently the bones become brittle. If there is deficiency in the production of parathormone blood calcium level falls. It leads to tetany, which affects the functioning of muscle.

**vii. Briefly explain Feedback Mechanisms and its types.**

**Ans: Feedback Mechanisms:**

Endocrine glands do not secrete their hormones at a constant rate. The rate varies with the needs of the body. Like many other functions in body, the secretion of hormones is also regulated by feedback mechanisms. Feedback mechanism means the regulation of a process by the output of the same process.

**Types of Feedback Mechanisms:**

Endocrine glands in human body

**i. Negative feedback:**

In negative feedback, the output of a process decreases or inhibits the process. This mechanism works to return a condition towards its normal value.

**Example:** When the blood glucose concentration rises, pancreas secretes insulin. It decreases the blood glucose concentration. Decline in the blood glucose concentration to a normal set-point inhibits the secretion of insulin.

Similarly, when blood glucose concentration drops below normal, pancreas secretes glucagon. It raises the blood glucose concentration. In this case, rise in the blood glucose concentration to a normal set-point inhibits the secretion of glucagon. In other words, the blood glucose concentration (output) controls the process i.e. the secretion of insulin and glucagon.

**ii. Positive feedback:**

In **positive feedback**, the changes resulting from a process increase the rate of process.

**Example:** Suckling action of an infant stimulates the production of a hormone in mother. This hormone works for the production of milk. More suckling leads to more hormone, which in turn leads to more milk production.

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks.**

**(2 x10 = 20)**

**Q4. a. Explain the location and function of these parts of brain; cerebrum, cerebellum, pituitary gland, thalamus, hypothalamus, medulla oblongata.**

**Ans. Central Nervous System:** The central nervous system consists of brain and spinal cord.

**Brain:** In animals, all life activities are under the control of brain. The structure of brain is suitable to perform this function. Brain is situated inside a bony cranium (part of skull).

**Meninges:** Inside cranium, brain is covered by three layers called meninges. Meninges protect brain and also provide nutrients and oxygen to brain tissue through their capillaries.

**Cerebrospinal fluid (CSF):**

The brain contains fluid-filled **ventricles** that are continuous with the **central canal** of spinal cord. Fluid within ventricles and central canal is called **cerebrospinal fluid** (CSF).

**The Divisions of Brain:**

There are three major regions in the brain of human and other vertebrates. These are forebrain,

**(i) Thalamus:**

Thalamus lies just below cerebrum. It serves as a relay centre between various parts of brain and spinal cord. It also receives and modifies sensory impulses (except from nose) before they travel to cerebrum. Thalamus is also involved in pain perception and consciousness (sleep and awakening).

**(ii) Hypothalamus:**

Hypothalamus lies above midbrain and just below thalamus. In humans, it is roughly the size of an almond. One of the most important functions of hypothalamus is to link nervous system and endocrine system. It controls the secretions of pituitary gland. It also controls feelings such as rage, pain, pleasure and sorrow.

**(iii) Cerebrum:**

Cerebrum is the largest part of forebrain. It controls skeletal muscles, thinking, intelligence and emotions. It is divided into two **cerebral hemispheres.**

**Olfactory bulbs:**

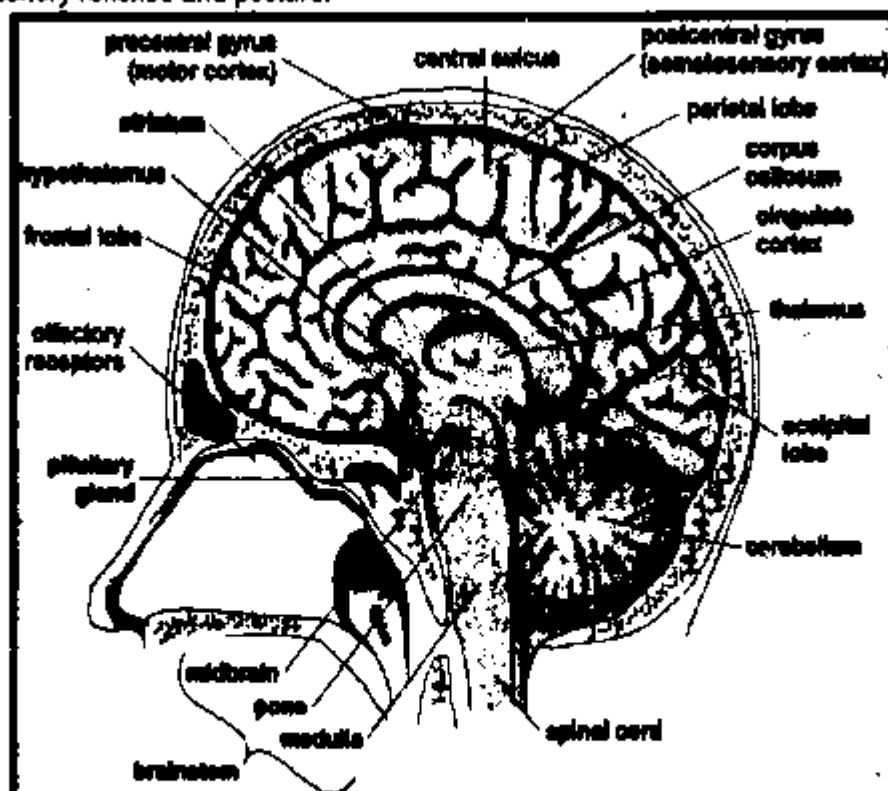
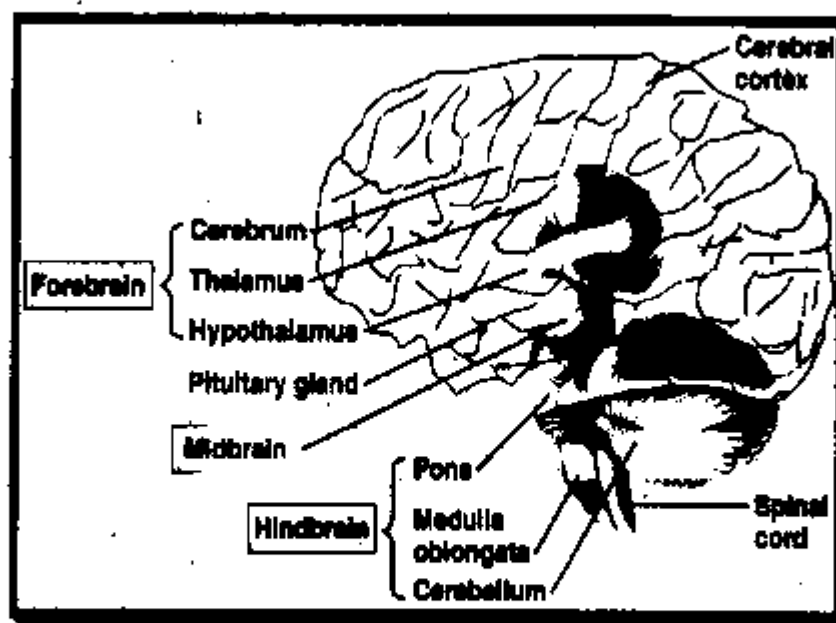
The anterior parts of cerebral hemispheres are called olfactory bulbs which receive impulses from olfactory nerves and create the sensation of smell.

The upper layer of cerebral hemispheres i.e. cerebral cortex consists of grey matter. The grey matter of nervous system consists of cell bodies and non-myelinated axons. Beneath this layer is present the white matter. The white matter of nervous system consists of myelinated axons.

**Lobes of cerebral cortex:**

Cerebral cortex has a large surface area and is folded in order to fit in skull. It is divided into four lobes.

| Lobe | Function |
|---|---|
| Frontal | Controls motor functions, permits conscious control of skeletal muscles and Coordinates movements involved in speech |
| Parietal | Contains sensory areas that receive impulses from skin |
| Occipital | Receives and analyzes visual information |
| Temporal | Concerned with hearing and smell |

**Midbrain:** Midbrain lies between hindbrain and forebrain and connects the two. It receives sensory information and sends it to the appropriate part of forebrain. Midbrain also controls some auditory reflexes and posture.

Structure of human brain

**Hindbrain:** Hindbrain consists of three major parts.

**(i) Medulla oblongata:**

Medulla oblongata lies on the top of spinal cord. It controls breathing, heart rate and blood pressure. It also controls many reflexes such as vomiting, coughing, sneezing etc. Information that passes between spinal cord and the rest of brain pass through medulla.

**(ii) Cerebellum:** Cerebellum is behind medulla. It coordinates muscle movements.

**(iii) Pons:**

Pons is present on top of medulla. It assists medulla in controlling breathing. It also serves as a connection between cerebellum and spinal cord.

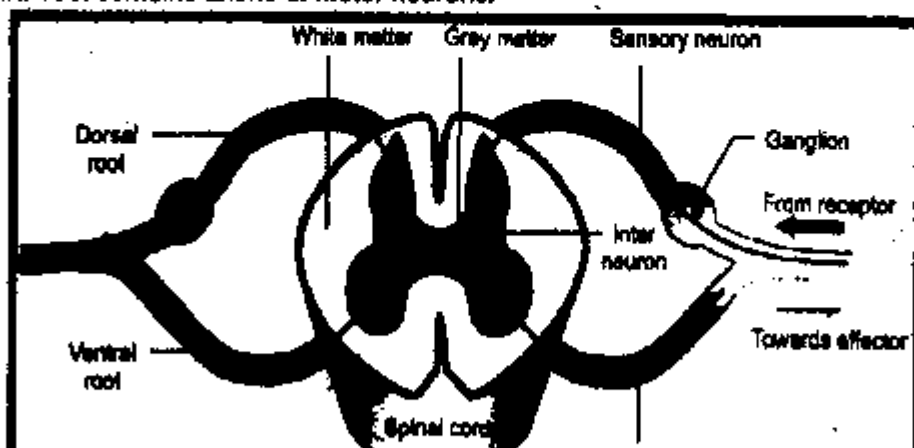
**Spinal Cord:**

The spinal cord is in fact a tubular bundle of nerves. It starts from brain stem and extends to lower back. Like brain, spinal cord is also covered by meninges. The vertebral column surrounds and protects spinal cord.

The outer region of spinal cord is made of white matter (containing myelinated axons). The central region is butterfly shaped that surrounds the central canal. It is made of grey matter (containing neuron cell bodies).

**Mixed nervous:**

31 pairs of spinal nerves arise along spinal cord. These are "mixed" nerves because each contains axons of both sensory and motor neurons. At the point where a spinal nerve arises from spinal cord, there are two roots of spinal nerve. Both roots unite and form one mixed spinal nerve.

- The dorsal root contains sensory axons and a ganglion where cell bodies are located.
- The ventral root contains axons of motor neurons.

**Functions of spinal cord:**

Spinal cord performs two main functions

i. It serves as a link between body parts and brain. Spinal cord transmits nerve impulses from body parts to brain and from brain to body parts.

ii. Spinal cord also acts as a coordinator, responsible for some simple reflexes.

**b. Define neuron and describe the structure of a general neuron.**

**Ans: Neuron or Nerve cell:**

Nerve cell or neuron is the unit of the nervous system. The human nervous system consists of billions of neurons plus supporting (neuroglial) cells.

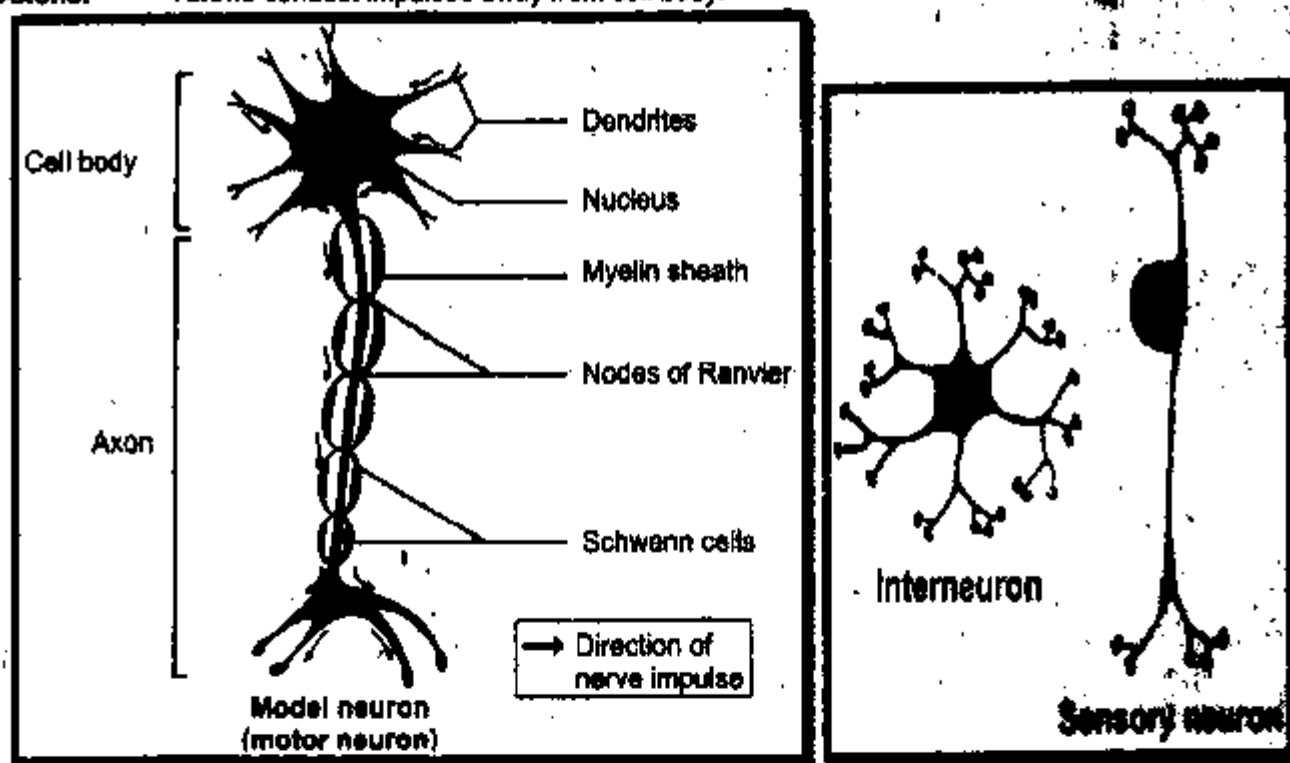
**Function of Neuron:**

Neurons are specialized cells that are able to conduct nerve impulses from receptors to coordinators and from coordinators to effectors. In this way they communicate with each other and with other types of body cells.

**Structure of Neuron:**

The nucleus and most of the cytoplasm of a neuron is located in its **cell body.** Different processes extend out from cell body these are called dendrites and axons.

**Dendrites:** Dendrites conduct impulses toward cell body.

**Axons:** Axons conduct impulses away from cell body.

Model Neuron (Motor neuron)

**Schwann cells:** Schwann cells are special neuroglial cells located at regular intervals along axons.

**Myelin sheath:** In some neurons, Schwann cells secrete a fatty layer called myelin sheath, over axons.

**Nodes of Ranvier:**

Between the areas of myelin on an axon, there are non-myelinated points, called the nodes of Ranvier. Myelin sheath is an insulator so the membrane coated with this sheath does not conduct nerve impulse.

**Saltatory ('jumping') impulses:**

A neuron, impulses 'jump' over the areas of myelin going from node to node. Such impulses are called saltatory ('jumping') impulses. This increases the speed of nerve impulse.

**Types of neuron:** On the basis of their functions, neurons are of three types;

i. **Sensory neurons:**

ii. **Interneurons:**

Interneurons form brain and spinal cord. They receive information, interpret them and stimulate motor neurons. They have many dendrites and axons.

iii. **Motor neurons:**

Motor neurons carry information from interneurons to muscle or glands (effectors). They have many dendrites but only one axon.

**Q5. a. Describe the structure of human eye.**

**Ans: Eye:**

Our eyes are located in small portions of skull known as the orbits or eye sockets. Eyelids wipe eyes and prevent dehydration. They spread tears on eyes, which contains substances for fighting bacterial infections. Eyelashes prevent fine particles from entering eye.

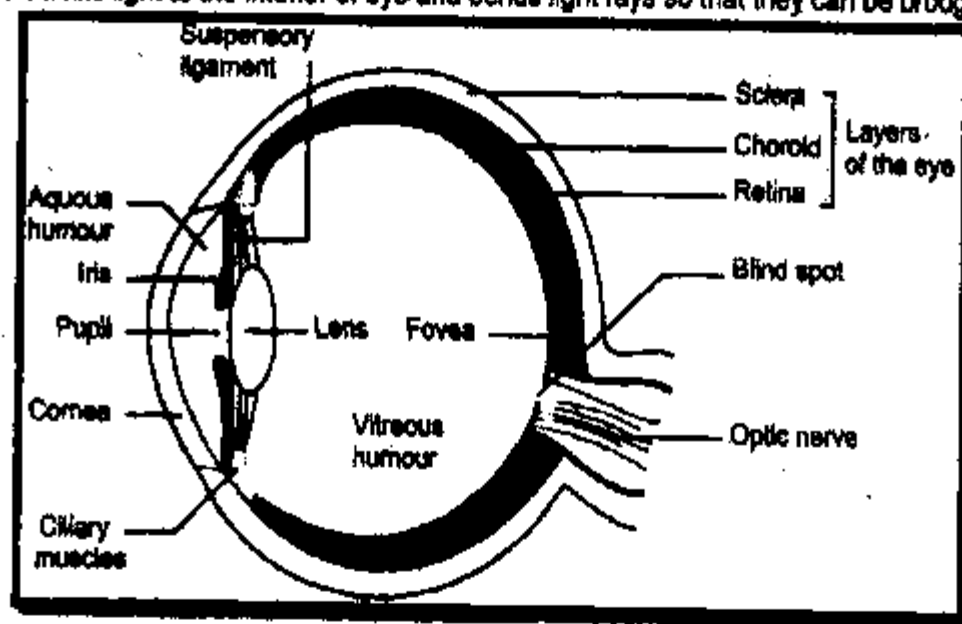
**Structure of human eye:** The structure of eye can be divided into three main layers.

I. **Outer layer:** The outer layer of eyeball consists of sclera and cornea.

**Sclera:**

Sclera gives eye most of its white colour. It consists of dense connective tissue and protects the inner components of eye and maintains its shape. In the front, sclera forms the transparent cornea.

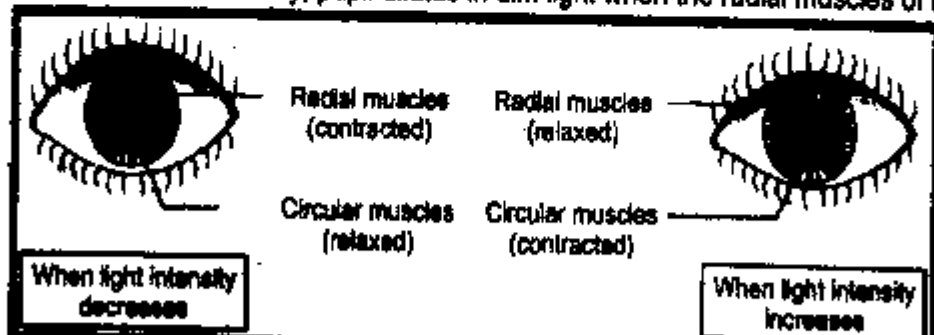
**Cornea:**

Cornea admits light to the interior of eye and bends light rays so that they can be brought to a focus.

Structure of human eye

ii. **Middle layer:**

**Choroid:** The middle layer is called choroid. It contains blood vessels and gives the inner eye a dark colour.

**Iris:** The dark colour prevents disruptive reflections within eye. Behind cornea, choroid bends to form a muscular ring, called **iris**.

**Pupil:** There is round hole, called **pupil**, in the centre of iris. After striking the cornea, light passes through the pupil. The size of pupil is adjusted by the muscles of iris. Pupil constricts in bright light when the circular muscles of iris contract. Similarly, pupil dilates in dim light when the radial muscles of iris contract.

**Convex lens:**

Behind iris, there is a convex lens, which focuses light on retina. Lens is attached to ciliary muscles of eye via a ring of **suspensory ligament**. To clearly see an object far away, ciliary muscles are relaxed and lens becomes less convex. When ciliary muscles contract, lens becomes more convex and round.

**iii. Inner layer:**

**Retina:**

The inner layer is sensory is called as retina. It contains the photosensitive cells called rods and cones and associated neurons.

**Rods:** Rods are sensitive to dim light while cones are sensitive to bright light and so distinguish different colours. Retina has two points i.e. fovea and optic disc.

**Fovea:**

Fovea is a dip in retina, directly opposite to lens and is densely packed with cone cells. It is largely responsible for colour vision and sharpness.

**Optic disc:**

Optic disc is a point on retina where the optic nerve enters retina. There are no rods and cones at this point, that is why it is also referred to as the blind spot.

**Chambers:**

The iris divides the cavity of eye into two chambers. The anterior chamber is in front of iris i.e. between cornea and iris; whereas the posterior chamber is between iris and retina.

**Aqueous humour:**

The anterior chamber contains a clear fluid known as aqueous humour **Vitreous humour:**

The posterior chamber contains a jelly-like fluid known as vitreous humour. It helps maintain the shape of eye and suspends the delicate **lens**.

**Sensation of vision:**

Light from objects enters eye and is refracted when it passes through cornea, aqueous humour, lens and vitreous humour. Lens also focuses light on retina. As a result, the image falls on retina. Rods and cones generate nerve impulses in the optic nerve. These impulses are carried to the brain, which makes the sensation of vision.

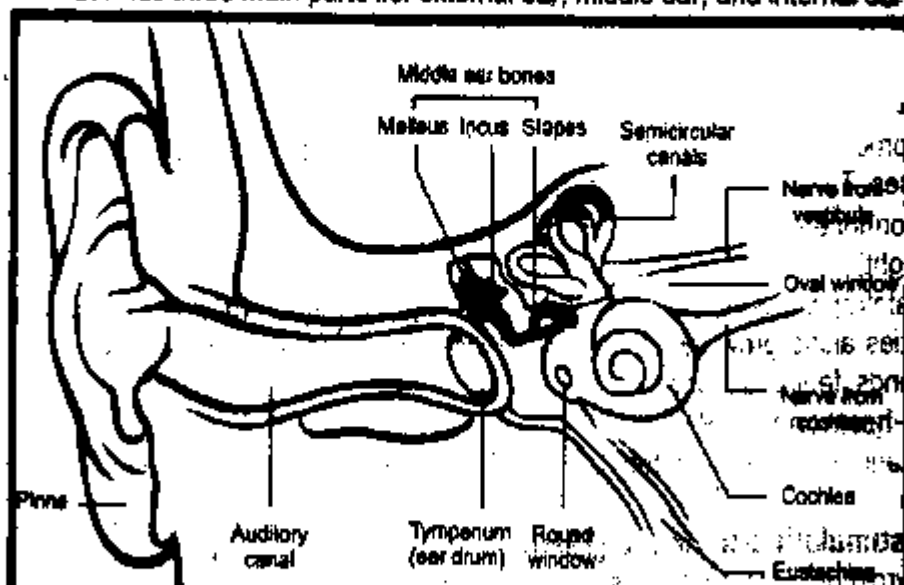
**Rhodopsin:**

Rods contain a pigment called rhodopsin. When light falls on rhodopsin, it breaks for generating a nerve impulse. In the absence of light, the breakdown products are again converted into rhodopsin.

Too much light being let in could damage the retina; too little light makes sight difficult.

**b. How would you describe the structure of the external, middle and inner ear of man?**

**Ans: Ear:** Our ear helps us in hearing and also to maintain the balance or equilibrium of the body.

**Structure of Ear:** Ear has three main parts i.e. external ear, middle ear, and internal ear.

**i. External Ear:**

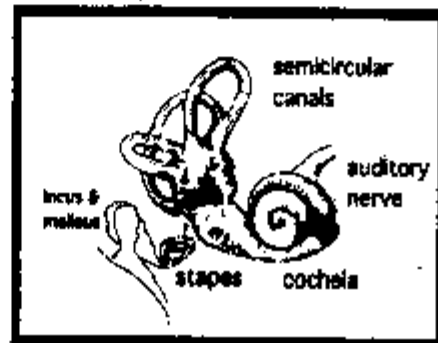
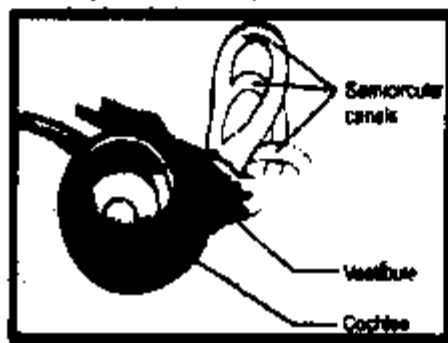
External ear consists of pinna, auditory canal and ear drum (tympanum). **Pinna** is the broad external part, made of cartilage and covered with skin. It helps to direct sound waves into **auditory canal**. There are special glands in the walls of auditory canal, which produce wax. The wax and the hairs in auditory canal protect ear from small insects, germs and dust. In additions to this, they help to maintain the temperature and dampness of auditory canal. Auditory canal ends in **ear drum**. This thin membrane separates external ear from middle ear.

**ii. Middle Ear:**

Middle ear is a chamber after external ear. Three small bones, called middle ear **ossicles**, are present in a chain in middle ear. These movable bones include **malleus, incus** and **stapes**. Malleus is attached with ear drum, then comes incus and finally stapes that is connected with a membrane called **oval window**. Oval window separates middle ear from inner ear. Middle ear also communicates with the nasal cavity through **Eustachian tube**. This tube regulates the air pressure on both sides of ear drum.

**iii. Inner Ear:**

Inner ear consists of three parts i.e. vestibule, semicircular canals and cochlea. **Vestibule** is present in the centre of inner ear. Three canals called **semicircular canals** are posterior to the vestibule. The **cochlea** is made of three ducts and wraps itself into a coiled tube.

Sound receptor cells are present within the middle duct of cochlea.

Structure of Inner ear

**Q6. Outline the major glands of the endocrine system (pituitary, thyroid, pancreas, adrenal, gonads), with name of their hormones and their functions.**

**Ans: 1. Pituitary Gland:**

It is a pea-shaped gland attached to the hypothalamus of brain. Many hormones (trophic hormones) of pituitary gland influence the secretions of other endocrine glands. However some hormones of this gland act directly on various tissues of body. There are two lobes of pituitary gland i.e. anterior lobe and **posterior lobe**.

**a. Anterior Lobe:** It produces many hormones.

**Somatotrophin:** One of its important hormones is somatotrophin (growth hormone).

**Function of Somatotrophin:** It promotes the growth of body.

**Dwarfism:** If the production of this hormone is diminished during growing age, the rate of growth decreases. This condition is called dwarfism.

**Gigantism:** If this hormone is excessively produced during growing age, it leads to gigantism (very tall and overweight).

**Acromegaly:** If somatotrophin is excessively produced after growing age, internal organs and body extremities alone grow large. This condition is known as acromegaly. Such persons will have large hands, feet and jawbones.

**Thyroid-stimulating-hormone (TSH):**

Another important hormone secreted by the anterior lobe of pituitary gland is thyroid-stimulating-hormone (TSH).

**Function of thyroid-stimulating-hormone (TSH):**

**b. Posterior Lobe:**

**Oxytocin and vasopressin:**

The posterior lobe of pituitary gland stores and secretes two hormones i.e. oxytocin and vasopressin (antidiuretic hormone: ADH). These hormones are produced by hypothalamus (a part of brain).

**Function of vasopressin:**

Vasopressin increases the rate of reabsorption of water from nephrons. When we have low amount of water in body fluids, pituitary gland secretes vasopressin and so more reabsorption of water occurs from nephrons into blood. In this way, body retains water and less amount of urine is produced.

**Diabetes Insipidus:**

On the other hand, when body fluids have more than normal water, there is a decline in the secretion of this hormone. If pituitary gland does not secrete this hormone in the required amount, less water is reabsorbed from nephrons and there is excessive loss of water through urine. This condition is known as diabetes insipidus.

**Function of Oxytocin:**

The hormone, oxytocin stimulates the contraction of uterus walls in mothers for child birth. Moreover, this hormone is necessary for the ejection of milk from breast.

**2. Thyroid gland:**

Thyroid gland is the largest endocrine gland in human body. It is present in neck region, below larynx.

**Thyroxin:** Thyroid gland produces a hormone thyroxin. Iodine is required for the production of this hormone.

**Goitre:** If a person lacks iodine in diet, thyroid gland cannot make its hormone. In this condition, thyroid gland enlarges. This disorder is called goitre.

**Function of Thyroxin:**

Thyroxin increases the breakdown of food (oxidation) and release of energy in body. It is also responsible for the growth of body.

**Hypothyroidism:**

Hypothyroidism is caused by the under-production of thyroxin. It is characterized by low energy production in body and slowing-down of heart-beat.

**Hyperthyroidism:**

Hyperthyroidism is caused by over-production of thyroxin. Its symptoms are increase in energy production, increased heart-beat, frequent sweating and shivering of hands.

**Calcitonin:**

The thyroid gland produces another hormone called calcitonin. It decreases the level of calcium ions in blood and promotes the absorption of calcium from blood into bones.

**3. Parathyroid glands:**

These are four glands situated on the posterior side of thyroid gland. They produce a hormone known as parathormone.

**Function of Parathormone:**

It increases the level of calcium ions in the blood. When there is increased production of parathormone, more than normal calcium, consequently the bones become brittle. If there is deficiency in the production of parathormone blood calcium level falls. It leads to tetany, which affects the functioning of muscle.

**4. Adrenal glands:**

Two adrenal glands are situated above kidneys. Each adrenal gland consists of two parts. The outer part is cortex and the inner part is medulla.

**Epinephrine or adrenaline:**

Adrenal medulla secretes a hormone called epinephrine or adrenaline in response to stress.

**Function of Epinephrine or adrenaline:**

It prepares our body to overcome emergency situations. Therefore, adrenaline is also termed as emergency hormone.

**Corticosteroids:**

The adrenal cortex secretes many hormones called corticosteroids which maintain the balance of salts

This portion secretes digestive enzymes, through a duct, into the small intestine.

**Islets of Langerhans:**

Some portions of pancreas serve as ductless (endocrine) gland. This portion contains groups of endocrine cells referred to as islets of Langerhans. These islets secrete two hormones i.e. insulin and glucagon.

**Glucagon:** Glucagon influences the liver to release glucose in blood and so the blood glucose concentration rises.

**Insulin:** Insulin influences the liver to take excess glucose from blood and so the blood glucose concentration falls.

**Diabetes mellitus:**

If a person's pancreas does not make normal quantity of insulin, the blood glucose concentration rises and we say that the person has diabetes mellitus. Persons with diabetes have loss of body weight, weakening of muscles and tiredness. The disease can be controlled by insulin administration. Formerly, insulin extracted from animals was used for this purpose. But now human insulin produced from bacteria through genetic engineering is available.

**6. Gonads:**

Testes (Singular, testis) and ovaries are the male and female reproductive organs i.e. gonads. In addition to producing gametes, gonads also secrete hormones, called sex hormones.

**Testosterone:** Testes secrete hormones e.g. testosterone, which is responsible for the development of male secondary sex characters such as growth of hair on face and coarseness of voice etc.

**Estrogen and progesterone:**

Ovaries secrete estrogen and progesterone, which are responsible for the development of female secondary characters such as the development of breast etc.

# Important Questions & Answers

**Q1. What is nerve impulse?**

**Ans:** A nerve impulse is a wave of electrochemical changes that travels along the length of neurons.

**Q2. What is ganglion?**

**Ans:** In certain parts of body, the cell bodies of many neurons form a group enveloped by a membrane. This is called ganglion.

**Q3. Enlist the division of the nervous system?**

**Ans: Divisions of the Nervous System:**

The nervous system consist of: **i.** The central nervous systems **ii.** Peripheral nervous systems

**i. Central Nervous System:** The central nervous system consists of brain and spinal cord.

**ii. Peripheral nervous systems:** The peripheral nervous system (PNS) is composed of nerves and ganglia.

**Q4. What is the Importance of Hippocampus?**

**Ans: Hippocampus:**

Hippocampus is a structure that is deep in the cerebrum. It functions for the formation of new memories. People with a damaged hippocampus cannot remember things that occurred after the but can remember things that occurred before damage.

**Q5. How rest of the brain connect to spinal cord?**

**Ans:** The medulla oblongata, pons, and midbrain connect the rest of brain to spinal cord. They are collectively referred to as brain stem.

**Q6. What is spinal cord and how long it is?**

**Ans:** Spinal cord is the continuation of medulla oblongata. Spinal cord is roughly 40cm long and about as wide as your thumb for most of its length.

**Q7. How would you describe the structure of peripheral nervous system?**

Ganglia are the clusters of neuron cell bodies outside CNS. Nerves arise or lead to brain and spinal cord. So they are named as cranial and spinal nerves,

Humans have 12 pairs of cranial nerves and 31 pairs of spinal nerves. Some cranial nerves are sensory, some are motor and some are mixed. On the other hand, all spinal nerves are mixed nerves.

**Pathways:**

The cranial and spinal nerves make two pathways i.e. sensory pathway (conducting impulses from receptors to CNS) and motor pathway (conducting impulses from CNS to effectors).

**Systems of Pathway:** Motor pathway makes two systems.

i. **Somatic Nervous System:**
It is responsible for the conscious and voluntary actions. It includes all of the motor neurons that conduct impulses from CNS to skeletal muscles.

ii. **Autonomic Nervous System:**
It is responsible for the activities, which are not under conscious control. It consists of motor neurons that send impulses to cardiac muscles, smooth muscle and glands.

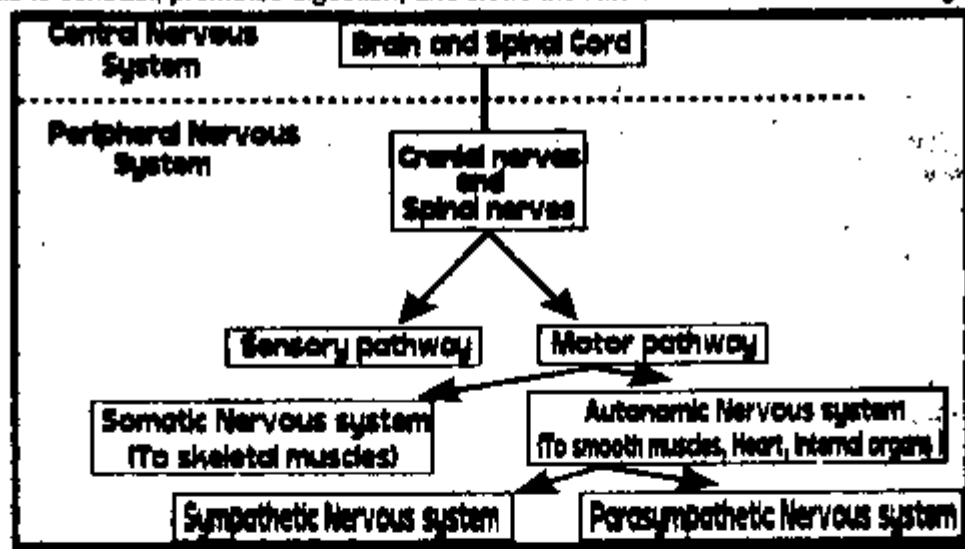
**Types of Autonomic Nervous System:**

Autonomic nervous system comprises of sympathetic system and parasympathetic system.

**Sympathetic nervous system:**

Sympathetic nervous system prepares body to deal with emergency situations. This is often called the "fight or flight" response. During an emergency situation, this system takes necessary actions. For example, it dilates pupils, accelerates heartbeat, increases breathing rate and inhibits digestion.

**Parasympathetic Nervous System:**

When stress ends, the parasympathetic nervous system takes action and normalizes all the functions. It causes pupils to contract, promotes digestion, and slows the rate of heartbeat and breathing rate.

Divisions of the nervous system

**Q8. Explain why you will need a reflex action?**

**OR**

**Explain the role of reflex action in a human body?**

**Ans: Reflex Action:**

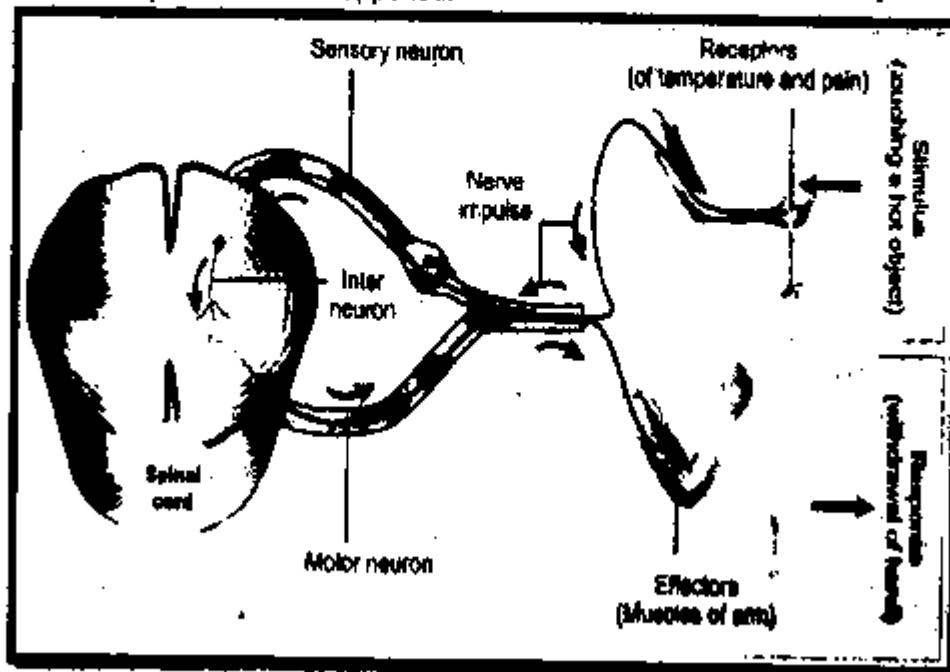
The involuntary and immediate response to a stimulus is called reflex action.

When central nervous system sends impulses to muscles and glands, two types of actions (responses) result.

i. The higher centres of brain control the conscious action or voluntary actions.
ii. When impulses are not passed to the higher centres of brain, it results in responses which are not under conscious control. Such responses are called involuntary actions. Sometimes, the involuntary response produced by the CNS is very quick. Such a response is called reflex action.

**Reflex arc:** The pathway followed by the nerve impulses for producing a reflex action, is called reflex arc.

**Example of reflex action:**

impulse is generated which is carried by sensory neurons to the interneurons of spinal cord. From interneurons, the impulse is passed to motor neurons, which carry it to the muscles of arm. As a result, the muscles contract to withdraw hand. During it, other interneurons transmit nerve impulses up to brain so that the person becomes aware of pain and what happened.

Reflex arc in a reflex action

**Receptors In Humans:**

We know that the organs or parts which are specifically built to detect particular type of stimuli are called sense organs or receptors. Main receptors in man are eyes, ears, nose, taste buds, receptors of touch, heat and cold etc.

**Q9. Why is colour vision essential for a pilot?**

**Ans:** For a pilot, colour vision is essential so that he/she can recognize aircraft position lights, light-gun signals, airport beacon, approach-slope indicators, and chart symbols, especially at night. A pilot must have the ability to perceive these colours necessary for the safe performance of his/her duties.

**Q10. Have you notice that during summer the urine output is low?**

**Ans:** Yes, during summer, the urine output is low. Due to increased sweating, the water level of blood is lowered. As a result pituitary releases more ADH into blood.

**Q11. Briefly describe Blood Glucose Concentration (BGC) Test.**

**Ans: Blood Glucose Concentration (BGC) Test:**

The amount of glucose in blood is measured by Blood Glucose Concentration (BGC) Test. It is used to diagnose diabetes. Blood glucose may be measured on a fasting basis (collected after an 8 to 10 hour fast), randomly (anytime) and after a meal.

The results of some BGC tests are given here.

| **Blood Glucose After 8-10 hours fast** | | |
|---|---|---|
| **BGC** | | **Diagnosis** |
| From 70 to 99 mg/100ml | | Normal |
| From 100 to 125 mg/100ml | | Pre-diabetic |
| 126 mg/100ml and above | | Diabetic |
| **Blood Glucose 2 hours after a 75 gram Glucose drink** | | |
| **BGC** | | **Diagnosis** |
| Less than 140 mg/100ml | | Normal |
| From 140 to 200 mg/100ml | | Pre-diabetic |
| Over 200 mg/100ml | | |

# GUESS PAPER & MODEL PAPER # 3

## BASED ON CHAPTER # 13 (Reduced Syllabus)

# SUPPORT AND MOVEMENT

**NOTE:**

1. **Only topic based relevant MCQs. Short and Long Questions are included.**
2. **All information in side boxes is excluded.**

| Chapter Name | Topics Included |
|---|---|
| **Support and Movement (Chapter # 13)** | Human Skeleton (57)<br>Bone and Cartilage (58-60)<br>Components of Human Skeleton (60)<br>Types of Joints (62-63)<br>Muscles and Movement (63-64) |

## SECTION – A (Marks 12)

**Time Allowed: 20 minutes** **Total Marks: 12**

**Note:** Section-A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

**Q.1 Encircle the correct option i.e. A / B / C / D. All parts carry equal marks.**

**i. Find the ball-and-socket joint.**
A. Joint in the finger bones B. Joint of neck and skull bones
C. Joint at elbow D. Joint at pelvic girdle and leg bones

**ii. All these are the parts of axial skeleton of humans except:**
A. Ribs B. Sternum C. Shoulder girdle D. Vertebral column

**iii. The disorders in which there is an accumulation of uric acid in joints:**
A. Gout B. Rheumatoid arthritis C. Osteoporosis D. Osteo-arthritis

**iv. What is correct about tendons?**
A. Tendons are flexible and they join muscles with bones
B. Tendons are non-elastic and they join bones with bones
C. Tendons are non-elastic and they join muscles with bones
D. Tendons are flexible and they join muscles with muscles

**v. How many bones make our skull?**
A. 14 B. 22 C. 24 D. 26

**vi. What are the main components of a bone?**
A. Marrow, spongy bone, wax B. Marrow, compact bone, wax
C. Compact bone and marrow D. Compact bone, spongy bone, marrow

**vii. What do some bones produce?**
A. Mucous B. Hormones C. Oxygen D. Blood cells

**viii. How would you define skeletal system?**
A. All the bones in body B. All the muscles and tendons
C. All the body's organs, both soft and hard tissues
D. All the bones in body and the tissues that connect them

**ix. Find the INCORRECT statement.**
A. Bone is where most blood cells are made
B. Bone serves as a storehouse for various minerals

x. The purpose of rib cage is to:
A. Protect the stomach B. Protect the spinal cord
C. Protect the heart and lungs D. Provide an object to which the lungs can attach

xi. In vertebrates vertebral column contains ________ bones.
A. 44 B. 22 C. 33 D. 55

xii. Which point of attachment is pulled when a muscle contracts?
A. Insertion B. Biceps C. Triceps D. Extension

# BIOLOGY SSC-II

**Time allowed: 2:40 Hours** **Total Marks: 53**

NOTE: Answer any six parts from Section 'B' and attempt any five parts from Section-C. Attempt any two questions from Section 'D' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)**

i. Differentiate between cartilage and bone.
ii. What is the role of skeleton in support and movement?
iii. Label the biceps and triceps in the following diagrams and also mention their contracted or relaxed states.

iv. Define movement? Write names of the types of movement.
v. What do you meant by exoskeleton?
vi. Write briefly about skeleton system and its role?
vii. Write briefly about cartilage.
viii. a. Name the longest bone in human body?
b. Name the smallest bone in human body?

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)**

i. Describe the role of bones in human skeletal system.
ii. The neck joint between vertebral column and head allows movements side to side, Can you think what would have happened if it were a ball-and-socket joint?
iii. Briefly explain Muscles and their Movement.
iv. Which point of attachment is pulled when a muscle contracts?
v. Aquatic animals need less skeletal supports than land animals of similar size propose an explanation for this fact.
vi. Define the following terms.
a. Fibrous cartilage b. Hinge joint c. Hyaline cartilage
vii. Define the following terms.
a. Ball and socket joint b. Biceps c. Bone

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks.** **(2×10 = 20)**

**Q4. a. What are the main components of the axial skeleton and the appendicular skeleton of human?**

**b. Describe the types of joints and give examples.**

**Q5. What are ligaments and tendons? What function do they perform?**

**Q6. Explain antagonism in muscle action selecting biceps and triceps as example.**

# SOLUTION OF GUESS PAPER & MODEL PAPER # 3

## SECTION- A (MCQs)

| i. D | ii. C | iii. A | iv. C | v. B | vi. D |
|---|---|---|---|---|---|
| vii. D | viii. D | ix. C | x. C | xi. C | xii. A |

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks.** **(6 × 3 = 18)**

**I. Differentiate between cartilage and bone.**

**Ans: Difference between Bone and Cartilage:**

| | Bone | Cartilage |
|---|---|---|
| **Types:** | Bones are classified into long, short, flat, irregular, sesamoid and sutural bones. | Types of cartilage include hyaline cartilage, fibrocartilage and elastic cartilage. |
| **Function:** | Bones protect the body against mechanical damage, assisting in the movement of the body, providing a framework and shape for the body, storing minerals and producing red blood and white blood cells. | The main functions of cartilage tissue include reducing friction at the joints, supporting tracheal and bronchial tubes, acting as shock absorbers between vertebrae, and maintaining the shape and flexibility of ear, nose and so on. |
| **Structure:** | Bone or osseous tissue is made up of osteoblasts (progenitor cells), osteocytes (mature bone cells), and osteoclasts (large cells that breakdown bone tissue for growth and repair), and bone lining cells (that regulate the movement of calcium) | Cartilage comprises of chondroblasts, which are precursor cells, chondrocytes, and dense matrix comprising of collagen and elastic fibres, in which the mature chondrocyte cells are embedded. |
| **Diseases/Disorders:** | Disorders of the bone consist of osteoporosis, osteosarcoma, osteomyelitis and osteogenesis imperfecta which is a genetic disorder and other disorders. | Diseases of the cartilage include osteoarthritis, achondroplasia, costochondritis, and other chondrodystrophies. |
| **Where found in the body:** | Bones make up the endoskeleton of vertebrates. | Cartilage is a much softer, more pliable component that is mostly found in between joints of bones. |

## *OR (Second Answer)*

**Cartilage:**

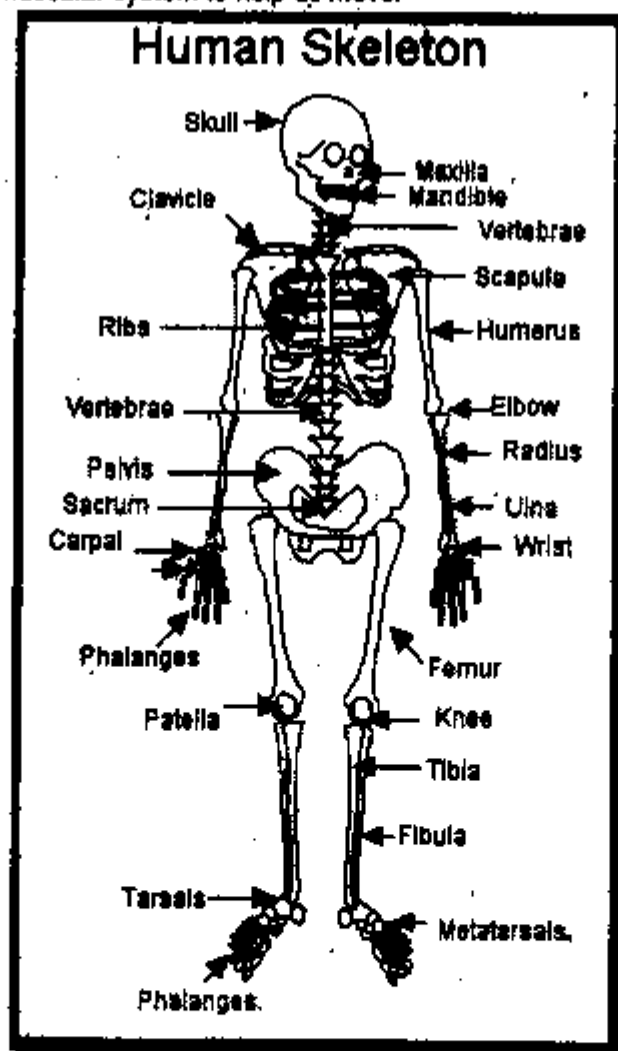
1. The cellular elements of the cartilages are chondrocytes.
2. The matrix contains a protein called chondrin.
3. It is soft except calcified cartilage.
4. It is avascular (not supplied with blood vessels).
5. Marrow cavity is absent.
6. Canaliculi are absent.
7. Cartilage is covered by perichondrium.

**Bone:**

1. The cellular elements of the bone are osteocytes.
2. The matrix contains a protein called ossein.
3. It is hard due to the deposition of phosphates and carbonates of calcium in the matrix.
4. It is vascular (supplied with blood vessels).
5. Marrow cavity is present.
6. Osteocytes rinterconnected canaliculi.
7. Bone is covered by periosteum.

**ii. What is the role of skeleton in support and movement?**

**Ans: Role of Skeletal System:**

The big functions of skeletal system are protection, support and movements. In our body, skeleton works very closely with the muscular system to help us move.

Similarly, skeleton provides protection to many internal organs e.g. skull protects brain, vertebral column protects spinal cord and ribs protect most of our other internal organs. Vertebral column also ...

**iii. Label the biceps and triceps in the following diagrams and also mention their contracted or relaxed states.**

**Ans:**

| Figure (A) | Figure (B) |
|---|---|
| Biceps (Contracted state) | Biceps (Relaxed state) |
| Triceps (Relaxed state) | Triceps (Contracted state) |

**iv. Define movement? Write names of the types of movement.**

**Ans: Movement:**

"Movement" is a general term meaning the act of changing place or position by entire body or by its parts.

**Types of Movement:** There are two types of movements:

I. Movements of body parts II. Locomotion

Locomotion is the movement of an animal as a whole from one place to another.

**v. What do you meant by exoskeleton?**

**Ans: Exoskeleton:**

The skeletal system of some invertebrates e.g. arthropods, is on the outside of the body, and is called exoskeleton.

**vi. Write briefly about skeleton system and its role?**

**Ans: Skeleton:**

Skeletal system or skeleton is defined as the framework of hard, articulated structures that provide physical support, attachment for skeletal muscles, and protection for the bodies of animals.

**Endoskeleton:**

Like other vertebrates, the human skeleton is on the inside of body and is called endoskeleton. In the living body, the skeleton is very much alive. Bones and cartilages are made of living cells and also have nerves and blood vessels in them. They grow and have the ability to repair themselves.

**Role of the Skeletal System in the Body:**

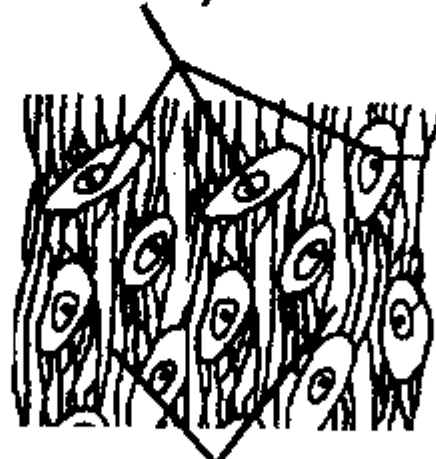
i. The skeletal system has many roles in the body:
ii. The skeleton supports the body against the pull of gravity. The large bones of the lower limbs support the trunk when standing.
iii. The skeleton also protects the soft body parts. The fused bones of the cranium surround the brain to protect it from injury. Vertebrae surround and protect the spinal cord, and bones of the rib cage help protect the heart and lungs.
iv. Bones work together with muscles as simple mechanical lever systems to produce body movement.
v. Bones are also important for providing electrolytes such as calcium to the body and producing some of the cells that make up blood.
vi. The bones of the ear canal are important for sound transduction.

**vii. Write briefly about cartilage.**

**Ans: Cartilage:**

Cartilage is a dense, clear blue-white firm connective tissue (but less strong than bone). The cells of cartilage are called chondrocytes. Each chondrocyte lies in a fluid space called lacuna present in the matrix

**i. Hyaline cartilage:**

Hyaline cartilage is strong yet flexible. It is found covering the ends of the long bones, in the nose, larynx, trachea and bronchial tubes.

chondrocytes in cartilage matrix

**ii. Elastic cartilage:**

Elastic cartilage is similar in structure to hyaline cartilage. It is also quite strong but has elasticity due to a network of elastic fibres in addition to collagen fibres. It is found in epiglottis, pinna etc.

**iii. Fibrous cartilage:**

Fibrous cartilage is very tough and less flexible due to large number of thick collagen fibres present in knitted form. It is found in intervertebral discs.

**viii. a. Name the longest bone in human body?**

**Ans:** The thigh bone is the longest bone in our body.

**b. Name the smallest bone in human body?**

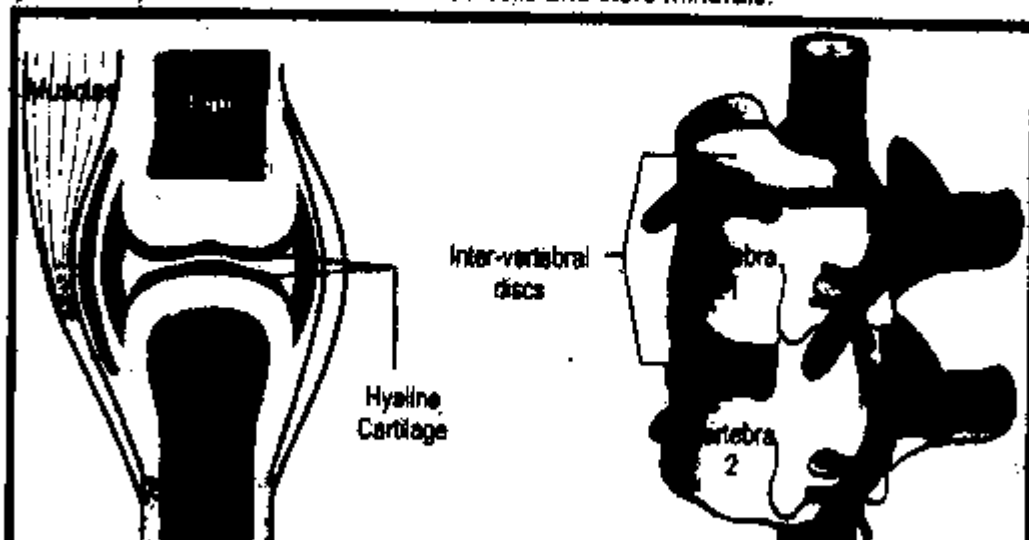
**Ans:** The smallest bone in the body is in our ear and is called the stirrup bone (stapes).

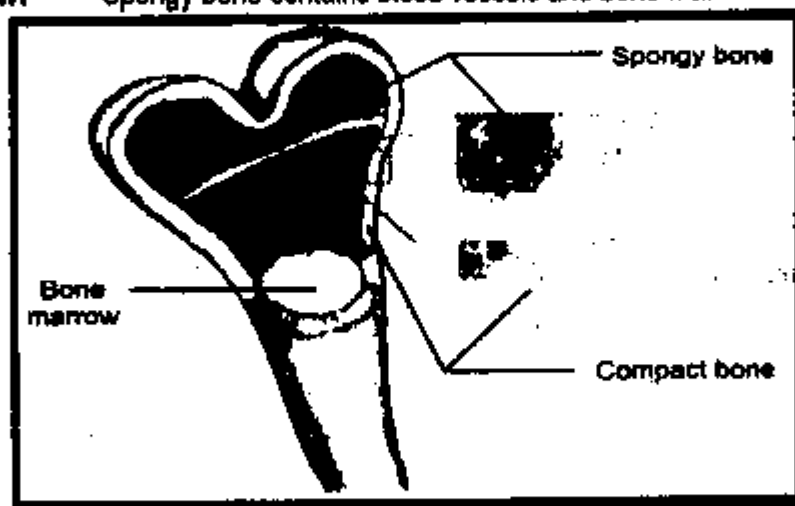
## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)**

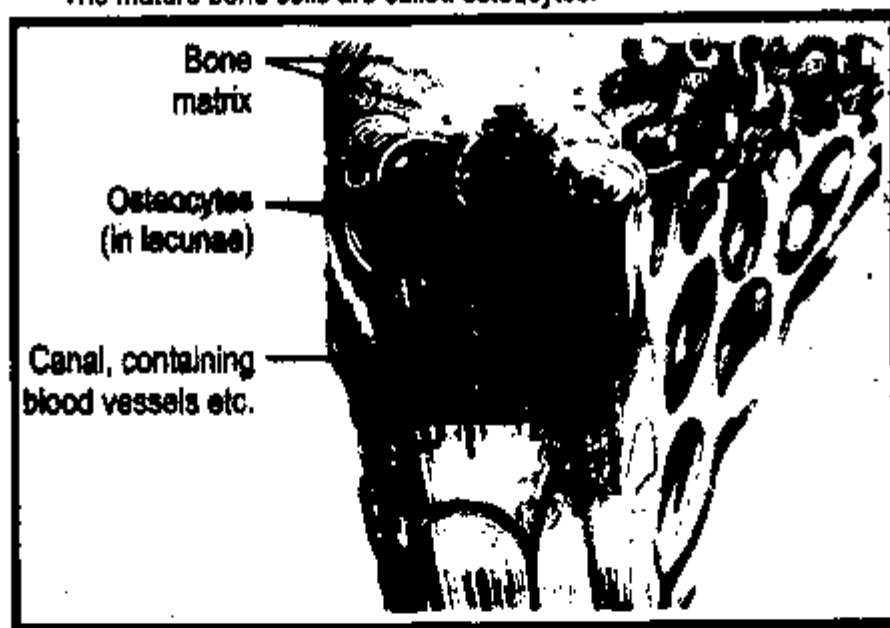
**i. Describe the role of bones in human skeletal system.**

**Ans: *Role of Bones:***

Bone is the hardest connective tissue in body. Bones not only move, support and protect the various parts of body but also produce red and white blood cells and store minerals.

**Components of a bone:**

I. **Compact bone:** The hard outer layer of a bone is called compact bone.
II. **Spongy bone:** The interior of bone is soft and porous. It is called spongy bone.
III. **Bone marrow:** Spongy bone contains blood vessels and bone marrow.

Compact and spongy bone

Like cartilage, the matrix of bones also contains collagen. But it also contains minerals e.g. calcium and phosphate. Cartilage contains a single type of cell. On the other hand, bones contain different types of cell.

**Osteocytes:** The mature bone cells are called osteocytes.

The internal structure of bone

ii. **The neck joint between vertebral column and head allows movements side to side, Can you think what would have happened if it were a ball-and-socket joint?**

**Ans:** Ball-and-socket joints allow movement in all directions. In such situation we can rotate neck in all directions.

iii. **Briefly explain Muscles and their Movement.**

**Ans: Muscles and Movement:**

When bones move at joints, they produce movements. The movements in bones are brought about by the contractions of skeletal muscles, which are attached with them by tendons.

**Role of skeletal muscles:** The role of skeletal muscles is as follows.

One end of a skeletal muscle is always attached with some immoveable bone.

**Origin:**

When a muscle is stimulated by a nerve impulse, it contracts to become shorter and thicker. Due to this contraction, it pulls the moveable bone (at insertion).

**iv. Which point of attachment is pulled when a muscle contracts?**

**Ans:** Insertion.

**v. Aquatic animals need less skeletal supports than land animals of similar size propose an explanation for this fact.**

**Ans:** Because the water supports the weight of the aquatic animal more than on land. Therefore, aquatic animals need less skeletal supports than land animals of similar size.

**vi. Define the following terms.**

**a. Fibrous cartilage b. Hinge joint c. Hyaline cartilage**

**Ans: a. Fibrous cartilage:**

The cartilage that has large number of fibres in the matrix e.g. the cartilage in intervertebral disc

**b. Hinge joint:**

A joint that permits movement of bones in one plane e.g. elbow and knee joints.

**c. Hyaline cartilage:**

The cartilage that has collagen fibres in its matrix; found covering the ends of the long bones, in the nose, larynx, trachea and bronchial tubes

**vii. Define the following terms.**

**a. Ball-and-socket joint b. Biceps c. Bone**

**Ans: a. Ball-and-socket joint:**

The joint that allows movement in all directions e.g. hip and shoulder joints.

**b. Biceps:** A flexor muscle on the front of the upper arm bone.

**c. Bone:** Hard connective tissue; moves, supports and protects the various organs of the body.

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks.**

**(2 ×10 = 20)**

**Q4. a. What are the main components of the axial skeleton and the appendicular skeleton of human?**

**Ans.** The adult human skeleton has 206 bones which are organized into two main components.

**i.** Axial skeleton **ii.** Appendicular skeleton

**i. Axial skeleton:**

Axial skeleton consists of the 80 bones in the head and trunk of body. It is composed of five parts.

**Skull bones:**

Skull contains 22 bones out of which 8 are cranial bones (enclosing the brain) and 14 are facial bones.

**Middle ear ossicles:** There are 6 middle ear ossicles (3 in each ear).

**Hyoid bone:** There is also a hyoid bone in neck.

**Vertebral column:** Vertebral column contains 26 bones (vertebrae).

**Chest:** The chest is made of a chest bone called sternum and 24(12 pairs) ribs.

**ii. Appendicular Skeleton:**

Appendicular skeleton is composed of 126 bones. Pectoral (shoulder) girdle is made of 4 bones. Arms have 6 bones. Both hands have 54 bones. Pelvic girdle (hips) has 2 bones. Legs have 6 bones. Both feet have 54 bones.

**b. Describe the types of joints and give examples.**

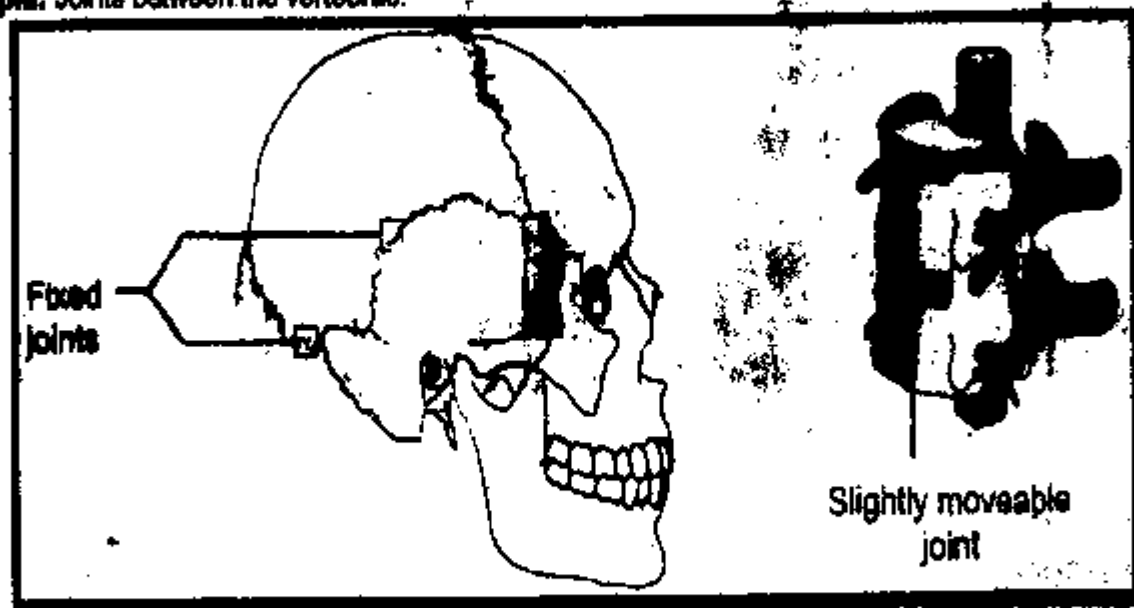
**Ans: Joint:**

A joint is the location at which two or more bones make contact. They allow movement and provide mechanical support.

**Types of joints:** Joints can be classified on the basis of the degree of movement they allow.

**i. Immoveable (Fixed) Joints:**

ii. **Slightly moveable joints:** Such joints allow slight movements.

**Example:** Joints between the vertebrae.

**Fixed and slightly moveable joints**

iii. **Moveable joints:** They allow a variety of movements.

**Example:** Shoulder joint, hip joint, elbow joint, knee joint etc.

**Types of Moveable joints:**

There are many types of moveable joints in body. The main types are hinge joints and ball-and-socket joints.

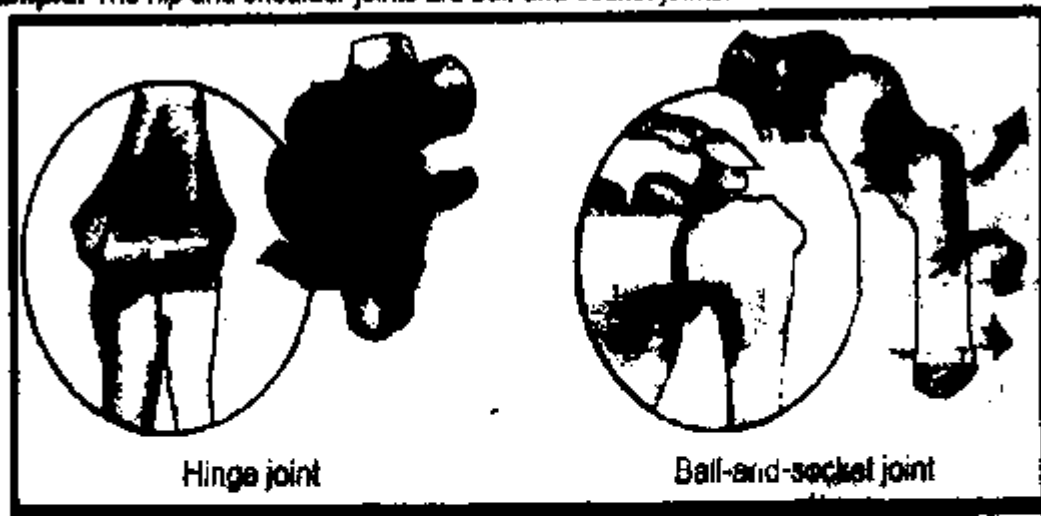
a. **Hinge joints:**

Hinge joints move back and forth like the hinge on a door and allow movements in one plane only.

**Example:** The knee and elbow are hinge joints.

b. **Ball-and-socket:**

Ball-and-socket joints allow movement in all directions.

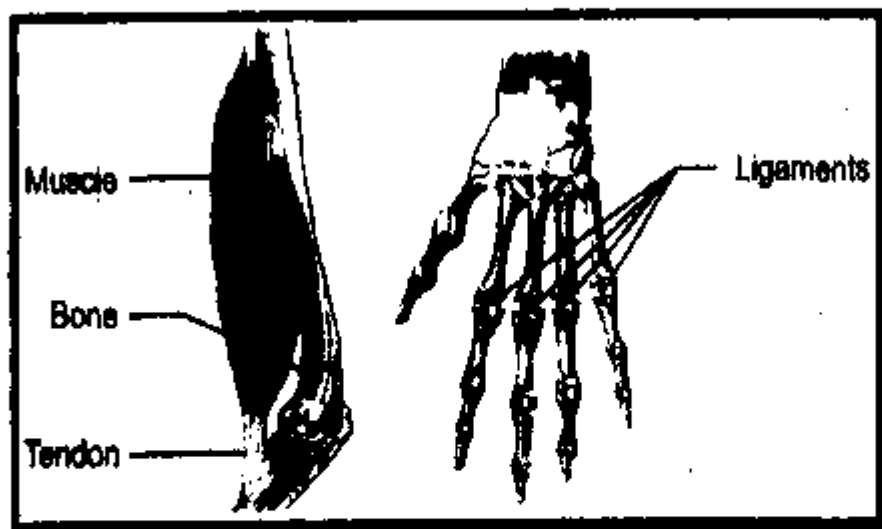
**Example:** The hip and shoulder joints are ball-and-socket joints.

**Two types of moveable joints**

**Q5. What are ligaments and tendons? What function do they perform?**

**Ans. Ligaments and Tendons:**

Tendons and ligaments are bands of connective tissue (made of collagen).

**Ligaments:** Ligaments are strong but flexible bands and join one bone to another at joints.

**Function of ligaments:** Ligaments prevent dislocation of bones at joints.

Tendons and ligaments

**Q6. Explain antagonism in muscle action selecting biceps and triceps as example.**

**Ans. Antagonism:**

Skeletal muscles are usually in pairs of antagonists. In an antagonistic pair, both muscles do opposite jobs. When one muscle contracts the other relaxes and this phenomenon is known as antagonism (antagonistic action).

**Flexor:** When a muscle contracts and bends the joint, it is known as flexor muscle and the movement is called flexion.

**Extensor:** When a muscle contracts and straightens the joint, it is known as extensor muscle and the movement is called extension. Following is an example of the antagonistic action of a pair of skeletal muscles.

**Biceps:** Biceps is a flexor muscle on the front of the upper arm bone.

**Triceps:** Triceps is an extensor muscle on the back of arm.

Both these muscle have their origin at pectoral girdle and insertion at one of the two bones of forearm.

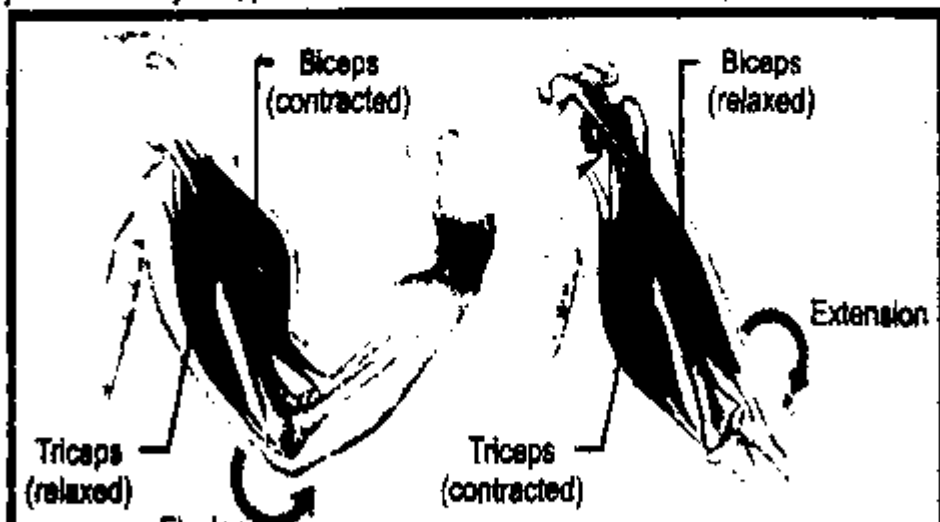
**Action of Antagonistic muscle (Biceps and Triceps):**

**Action of Flexion:**

When biceps contracts, the forearm (insertion end) is pulled upward. It is the flexion of elbow joint. During this flexion, triceps muscle relaxes.

**Action of Triceps:**

When triceps muscle contracts, forearm is pulled down. It is the extension at elbow joint. During it, biceps muscle relaxes.

In this way, biceps and triceps make up an antagonistic pair of muscles. Similar pairs, working antagonistically across other joints, provide for almost all the movements of skeleton.

# GUESS PAPER & MODEL PAPER # 4

## BASED ON CHAPTER # 14 (Reduced Syllabus)

## REPRODUCTION

**NOTE:**

1. Only topic based relevant MCQs. Short and Long Questions are included.
2. All information in side boxes is excluded.

| Chapter Name | Topics Included |
|---|---|
| Reproduction (Chapter # 14) | Reproduction (70)<br>Methods of Asexual Reproduction (70-75)<br>Binary Fission, Fragmentation, Budding, Spore Formation.<br>Parthenogenesis. Vegetative Propagation<br>(natural and Artificial Vegetative Propagation Excluded)<br>Sexual reproduction in plants (78)<br>Sexual Reproduction in Flowering Plants (78-81)<br>Pollination and Its Types<br>Sexual Reproduction in Animals (84)<br>Formation of Gametes (84-85)<br>Reproduction in Rabbit (87-88) |

## SECTION – A (Marks 12)

**Time Allowed: 20 minutes** **Total Marks: 12**

**Note:** Section-A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

**Q.1 Encircle the correct option i.e. A / B / C / D. All parts carry equal marks.**

**i. Growing an entire new plant from part of the original plant is called;**
A. Budding B. Regeneration
C. Fragmentation D. Vegetative propagation

**ii. Rhizopus reproduces asexually by;**
A. Binary fission B. Budding
C. Spore formation D. Endospore formation

**iii. Acorn develops into new garlic plant. This is the process of:**
A. Vegetative propagation B. Regeneration
C. Meiosis D. Gametogenesis

**iv. Which is NOT an advantage of grafting?**
A. The graft is identical to the parent plant
B. Grafting allows the propagation of seedless fruits
C. The graft combines the characteristics of two plants
D. Grafting may allow for the faster production of desirable fruits

**v. Pollination is the transfer of pollens from;**
A. Antherto stigma B. Stigma to anther
C. Sepal to petal D. Petal to sepal

**vi. Double fertilization in plants means;**
A. Fusion of two sperms with two egg cells

vii. **After fertilization in plants, the fruit develops from;**
A. Ovule wall B. Petals C. Ovary wall D. Anther

viii. **Which part of the female reproductive system receives egg cells from the ovary?**
A. Fallopian tube B. Uterus C. Vagina D. Cervix

ix. **Inside testes, the sperms are produced in;**
A. Vas deferens B. Sperm duct
C. Seminiferous tubules D. Collecting ducts

x. **Which of these cells has haploid number of chromosomes?**
A. Spermatogonium B. Primary spermatocyte
C. Secondary spermatocyte D. All of these

xi. **The embryonic stem above the point of attachment of cotyledon(s) is called _______.**
A. Radical B. Plumule C. hypocotyl D. Epicotyl

xii. **_______ is essential for the respiration in the cells of embryo.**
A. Oxygen B. Nitrogen C. Water D. Carbon

# BIOLOGY SSC-II

**Time allowed: 2:40 Hours** **Total Marks: 53**

**NOTE: Answer any six parts from Section 'B' and attempt any five parts from Section-C. Attempt any two questions from Section 'D' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.**

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)**

i. **"Parthenogenesis is a type of asexual reproduction". Give comments on this statement.**
ii. **Outline the life cycle of a flowering plant.**
iii. **What structural adaptations will you find in a wind-pollinated flower?**
iv. **Define reproduction. Briefly describe its importance and types.**
v. **Enlist the methods of asexual reproduction.**
vi. **Give examples of insect and wind pollinated flowers.**
vii. **Give an introduction of sexual reproduction in plants.**
viii. **Explain Sexual Reproduction in Flowering Plants.**

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)**

i. **Briefly describe the structure of flower.**
ii. **Differentiate between self and cross pollination.**
iii. **What structural adaptations will you find in insect and a wind-pollinated flowers?**
iv. **What is parthenocrapy?**
v. **Give an introduction of sexual reproduction in animals.**
vi. **Write a note on the formation of gametes (Gametogenesis):**
vii. **Write a note on the fertilization and development in rabbit.**

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks. (2 ×10 = 20)**

**Q4. What are the different ways by which prokaryotes, protozoans and fungi reproduce asexually?**
**Q5. Write a note on the male and female reproductive systems of rabbit.**
**Q6. a. Outline the methods of asexual reproduction in animals.**

# SOLUTION OF GUESS PAPER & MODEL PAPER # 4

## SECTION- A (MCQs)

| i. D | ii. C | iii. A | iv. A | v. A | vi. B |
|---|---|---|---|---|---|
| vii. B | viii. A | ix. C | x. C | xi. D | xii. A |

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)**

**i. "Parthenogenesis is a type of asexual reproduction". Give comments on this statement.**

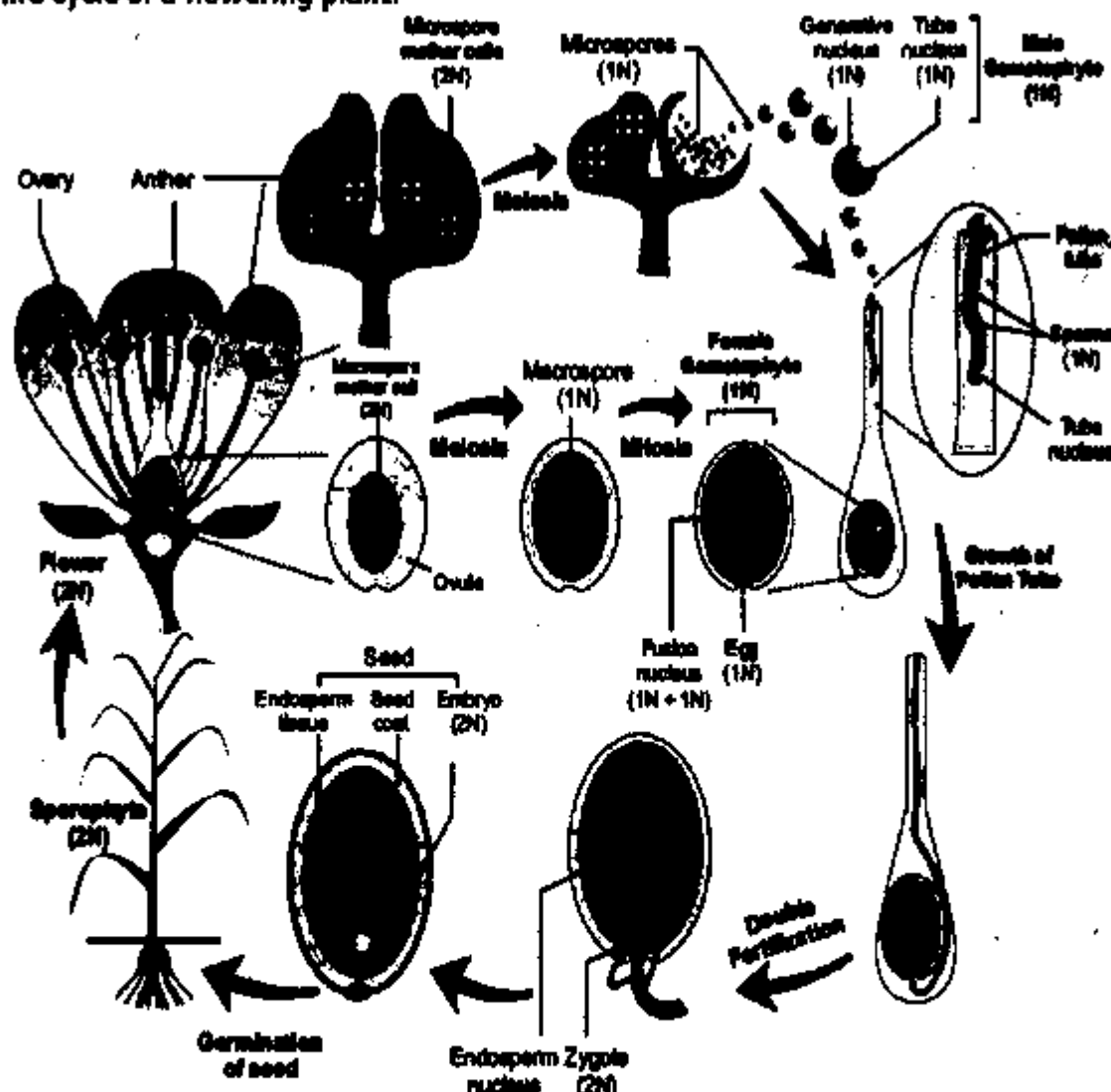
**Ans:** Parthenogenesis is a form of asexual reproduction in which growth and development of embryos occur without fertilization. In plants, parthenogenesis means development of an embryo from an unfertilized egg cell.

Parthenogenesis is a form of asexual reproduction in which an unfertilized egg develops into new offspring. Therefore, Parthenogenesis is a type of asexual reproduction.

**Examples:** Some fishes, frogs and insects reproduce by means of parthenogenesis.

Similarly, queen honeybee lays eggs in the cells of honeycomb. Many eggs remain unfertilized and develop into haploid males (drones) by parthenogenesis. At the same time, some eggs are fertilized by male bees and these develop into diploid females (new queen and worker bees).

**ii. Outline the life cycle of a flowering plant.**

**Ans:** life cycle of a flowering plant:

**iii. What structural adaptations will you find in a wind-pollinated flower?**

**Ans: Adaptations in wind-pollinated flowers:**

| Feature | Wind Pollinated Flowers |
|---|---|
| Size | Generally small |
| Colour | Petals green or dull in colour |
| Nectar | Do not produce nectar |
| Floral arrangement | Flowers hang down for easy shaking |
| Stamens and stigmas | Hang out of ring of petals |
| Pollen grains | Large number produced / light with smooth surface |
| Stigma | Feathery branches for catching pollen |

**iv. Define reproduction. Briefly describe its importance and types.**

**Ans: Reproduction:**

Reproduction is defined as the production of individuals of the same species i.e. the next generation of species. While it is one of the fundamental characteristics of living things, it is not an essential life process.

**Importance of Reproduction:**

Reproduction is thus essential for the continuation of species. It ensures that the genetic material of one generation is transmitted to the next. Each generation produces more offspring's for the next generation.

Many individuals die due to various reasons like diseases, competition, genetic factors etc. before reaching the reproductive age. Only the fittest and the best survive and reach the reproductive age. This ensures that the advantageous characteristics are transmitted to the next generation.

**Types of reproduction:** There are two basic types of reproduction.

**i. Asexual reproduction:**

Asexual reproduction means simple cell division that produces an exact duplicate of an organism. There are many types of asexual reproduction which we shall discuss on the following pages.

**ii. Sexual reproduction:**

Sexual reproduction involves the joining (fusion) of male and female sex cells i.e. gametes.

**v. Enlist the methods of asexual reproduction.**

**Ans: Methods of Asexual Reproduction:**

Asexual reproduction does not involve the fusion of gametes. There are many types of asexual reproduction, all producing individuals that are genetically identical to each other and to the parent.

i. Binary fission ii. Fragmentation iii. Budding
iv. Spore Formation v. Parthenogenesis vi. Vegetative Propagation

**vi. Give examples of insect and wind pollinated flowers.**

**Ans: Examples of insect pollinated flowers:**

Examples of insect pollinated flowers are buttercup, rose, wallflower, sunflower, orchid etc.

**Examples of wind pollinated flowers:**

Examples of wind pollinated flowers are grasses, hazel, willow, corn etc.

**vii. Give an introduction of sexual reproduction in plants.**

**Ans: Sexual reproduction in plants:**

Sexual reproduction involves the production of gametes (sperms and egg cells) and their fusion i.e. fertilization. Gametes are produced in special structures in plant body.

The major plants groups are mosses, ferns and seed plants. The seed plants include gymnosperms and angiosperms (flowering plants). Plant groups use different methods for bringing the sperm and egg cells together.

In mosses and ferns sperms are motile and can swim to egg cells. Therefore, these plants require water (in the form of dew or rain) for sexual reproduction.

On the other hand, gymnosperms and angiosperms have special methods for carrying their sperms to egg cells. They do not need water for reproduction.

One generation is diploid and produces spores. It is called sporophyte generation.

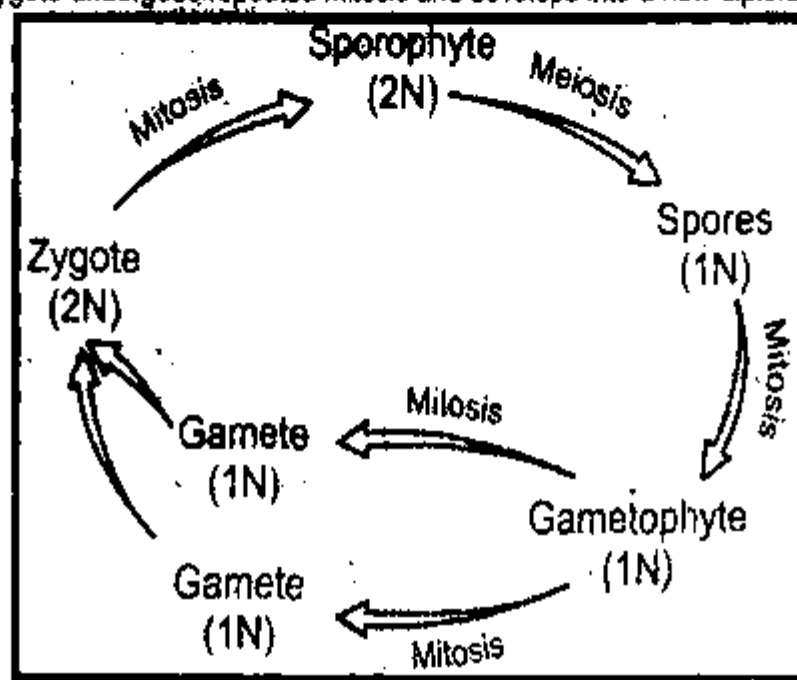
**Gametophyte generation:**

The other generation is haploid and produces gametes. It is called gametophyte generation.

**Alternation of generations:**

The phenomenon in which two different generations alternate with each other during life cycle is known as alternation of generations.

**Significance of sexual reproduction in plants:**

In most plants, sporophyte generation is dominant. It means that it is big in size and is independent. Sporophyte produces haploid spores by meiosis. The spores develop into gametophyte. It is small in size and depends upon sporophyte. It produces gametes by mitosis. The male and female gametes fuse and form diploid zygote. The zygote undergoes repeated mitosis and develops into a new diploid sporophyte.

An overview of alternation of generations in plants

**viii. Explain Sexual Reproduction in Flowering Plants.**

**Ans: Sexual Reproduction in Flowering Plants:**

**Pollination:** When pollen grains mature, they are transferred to stigma. It is called pollination.

**Pollen tube:**

On reaching the stigma, the tube nucleus of pollen grain constructs a pollen tube. The pollen tube contains a tube nucleus and two sperms. The tube grows through style and ovary and enters ovule. Here, it bursts and releases the sperms. Both sperms enter the female gametophyte. One sperm fuses with egg and forms a diploid **zygote**. The other sperm fuses with diploid **fusion nucleus** and forms a triploid (3N) nucleus called **endosperm nucleus**.

**Double fertilization:** Since the process of fertilization involves two fusions, it is called double fertilization.

**Seed and Fruit Formation:**

Zygote develops into embryo and endosperm nucleus develops into endosperm tissue (food of the growing embryo). Ovule then becomes **seed** and ovary changes into **fruit**. When seeds mature, they are dispersed. If seeds get suitable conditions, their embryos develop into new plants (the diploid sporophytes of the next generation).

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)**

**i. Briefly describe the structure of flower.**

**Calyx:** Calyx is the outermost whorl. It usually green in colour.

**Sepals:** Individual units (leaflets) of calyx are called sepals. Sepals protect the inner whorls at bud stage.

**Corolla:** Corolla is the next inner whorl and is often coloured brightly.

**Petals:** Individual units (leaflets) of corolla are called **petals.** They serve to attract bees, birds, etc. which are the agents of pollination.

**Androecium:**

Third whorl i.e. androecium is the male reproductive part of flower. Its units are called **stamens.** Each stamen has a thread-like **filament** at the free end of which **anther** is attached. Another has pollen-sacs in which haploid **microspores** (pollen grains) are produced through meiosis.

**Tube nucleus and generative nucleus:**

Each microspore germinates into the male gametophyte generation. During it, the nucleus of microspore undergoes mitosis and produces two nuclei i.e. a **tube nucleus** and a **generative nucleus.** The generative nucleus again undergoes mitosis and produces two **sperms.** So, a germinated microspore has a tube nucleus and two sperms. All these structures are the male gametophyte generation of plant.

**Gynoecium:**

Fourth whorl i.e. gynoecium is the female reproductive part of flower. Its units are called **carpels** (or pistils). Each carpel is made up of the basal **ovary,** middle **style** and upper **stigma.** Inside ovary, there is one to many **ovules.**

**Macrospore:**

Inside each ovule, one haploid macrospore is produced through meiosis. Macrospore germinates into the female gametophyte generation. During it, macrospore undergoes mitosis and produces an egg cell and some associated structures (e.g. fusion nucleus). Egg cell and associated structures are the female gametophyte generation of plant.

**ii. Differentiate between self and cross pollination.**

**Ans: Pollination:**

The transfer of pollen grains from flower's anther to stigma is called pollination.

**Self pollination:**

Self pollination is defined as the transfer of pollen grains from the anther to the stigma of the same flower or other flower of the same plant.

**Cross pollination:**

Cross pollination is the transfer of pollen grains from the flower on one plant to the flower on other plant of the same species. Cross pollination is brought about by various agencies like wind, water, bees, birds, bats and other animals including man.

Self pollination (left)and (right)

**iii. What structural adaptations will you find in insect and a wind-pollinated flowers?**

**Ans: Adaptations in insect-pollinated and wind-pollinated flowers:**

| Feature | Insect Pollinated Flowers | Wind Pollinated Flowers |
|---|---|---|
| Size | Generally large | Generally small |
| Colour | Petals brightly coloured | Petals green or dull in colour |

| Pollen grains | Small number produced / heavy and sticky | Large number produced / light with smooth surface |
|---|---|---|
| Stigma | Pinhead shaped with no branches | Feathery branches for catching pollen |

An insect – pollinated flower (left)and a wind – pollinated (right)flowers

**iv. What is parthenocrapy?**

**Ans: Parthenocrapy:**

In some plants, ovaries develop into fruit without the fertilization inside their ovules. This process is known as parthenocarpy and it result in seedless fruit e.g. bananas and seedless varieties of grapes.

**v. Give an introduction of sexual reproduction in animals.**

**Ans: Sexual Reproduction in Animals:**

Most animals reproduce sexually. The sexual reproduction is based on the formation and the fusion of male and female gametes.

**vi. Write a note on the formation of gametes (Gametogenesis):**

**Ans: Formation of Gametes (Gametogenesis):**

The formation of gametes is called gametogenesis. In this process, diploid (2N) gamete-mother cells undergo meiosis and form haploid (1N) gametes. The male and female gametes (sperms and egg cells or ova) are produced in specialized organs called gonads.

**Testes:** Male gonads are called testes (*Singuler*, testis).

**Ovaries:** While female gonads are called ovaries.

**Spermatogenesis:** The production of sperms in testes is called spermatogenesis.

**Oogenesis:** The production of egg cells in ovaries is called oogenesis.

**vii. Write a note on the fertilization and development in rabbit.**

**Ans: Fertilization and Development in Rabbit:**

Rabbits can breed throughout the year but male rabbits are commonly sterile during the summer months. Male rabbit deposits its sperms in the vagina (birth canal) of female. Sperms swim through cervix and uterus to fallopian tubes where they fertilize the egg cells, released from ovary.

After fertilization, zygote is carried to uterus. By this time, the zygote has started dividing and is now called embryo. The embryo is implanted in uterus walls.

**Placenta:** A connection, called placenta, is established between embryo and uterus wall.
Embryo develops into new offspring (rabbit kit) in 30-32 days, after which it is born.

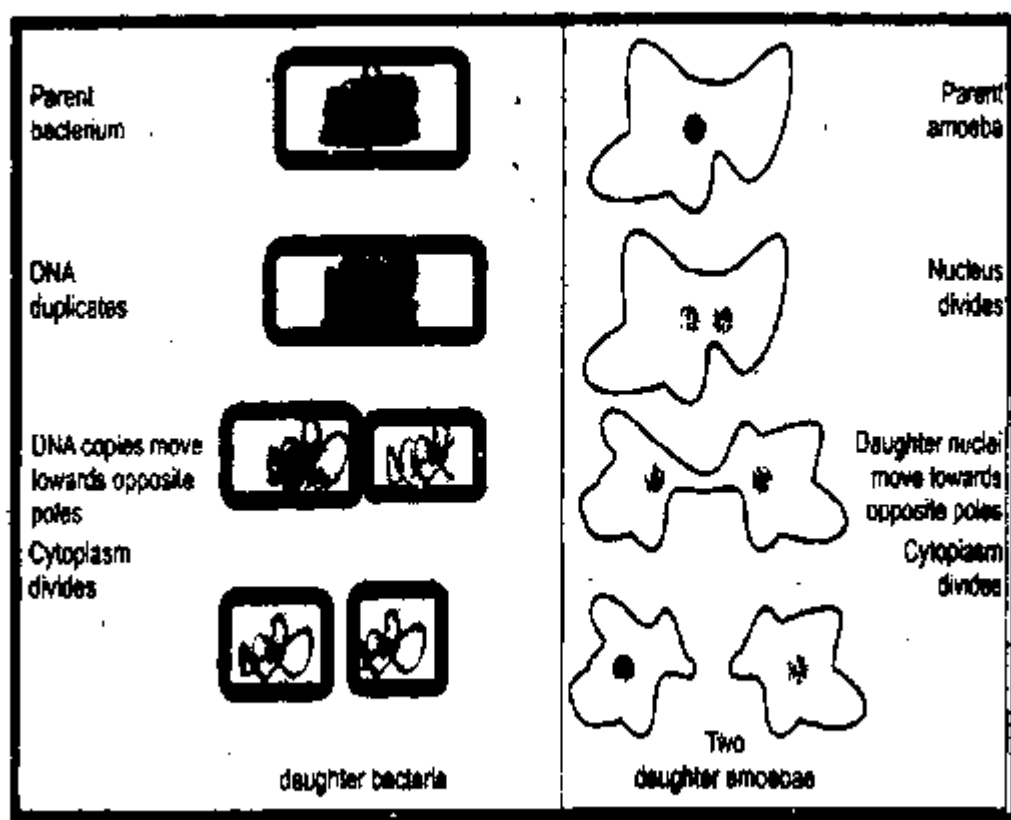
## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks.**

**(2 × 10 = 20)**

**Q4. What are the different ways by which prokaryotes, protozoans and fungi reproduce asexually?**

**Ans: i. Asexual reproduction in prokaryotes:**

**Binary fission:**

Binary fission in a bacterium (left) and in a Amoeba (right)

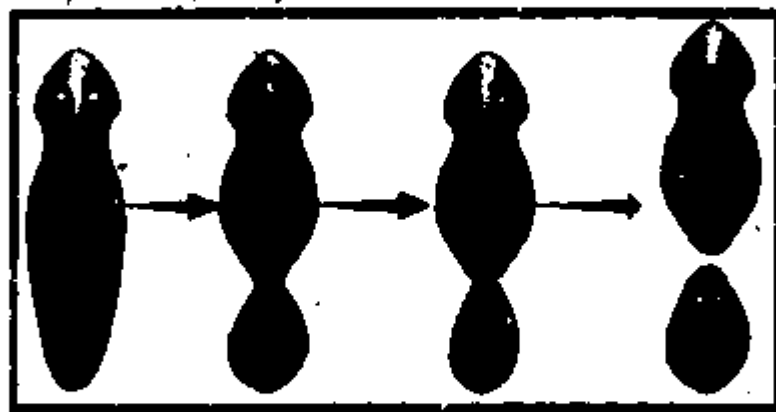
**Duplication of DNA:**

During binary fission in bacteria, the DNA is duplicated and so two copies of DNA are formed. The two copies move towards the opposite poles of cell. The cell membrane invaginates in centre and divides the cytoplasm into two. New cell wall is deposited between two cross membranes. It results in the formation of two daughter bacteria, which grow in size and divide again.

**Division of Nucleus of Parent Organism:**

During binary fission in unicellular eukaryotes, the nucleus of parent organism divides into two (by mitosis). It is followed by the division of cytoplasm. So two daughter cells of almost equal size are formed. Daughter cells grow in size and then divide again.

**Binary Fission in invertebrates:**

Some invertebrates also reproduce asexually through binary fission. During this reproduction, body is cut into two halves (fission) and the missing body parts are regenerated in both halves. This type of asexual reproduction is common in planaria and many echinoderms.

Binary fission in a planarian

**Multiple Fission:**

Some unicellular organisms (e.g. *Amoebae*) form hard walls called cysts around them, under

**ii. Asexual reproduction of protozoans:**

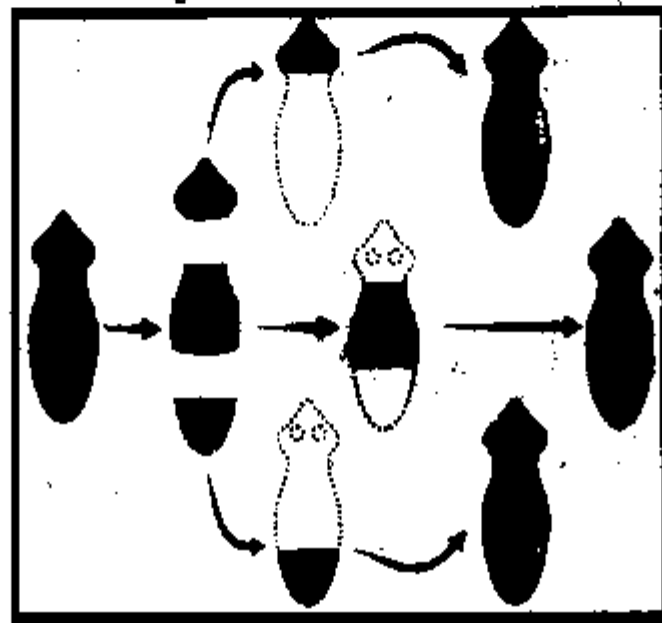
Asexual reproduction of protozoans occurs when the cell divides in half by binary fission. Some which are parasites multiply within the host. Some protozoans reproduce sexually as well. This can happen when two protozoans carrying half of their regular genetic material fuse together and form a new cell. Others exchange genetic material during mating.

**iii. Asexual reproduction in Fungi:**

**a. Fragmentation:**

A type of asexual reproduction in which the animal breaks up into many pieces and each piece develops into a mature animal is called fragmentation.

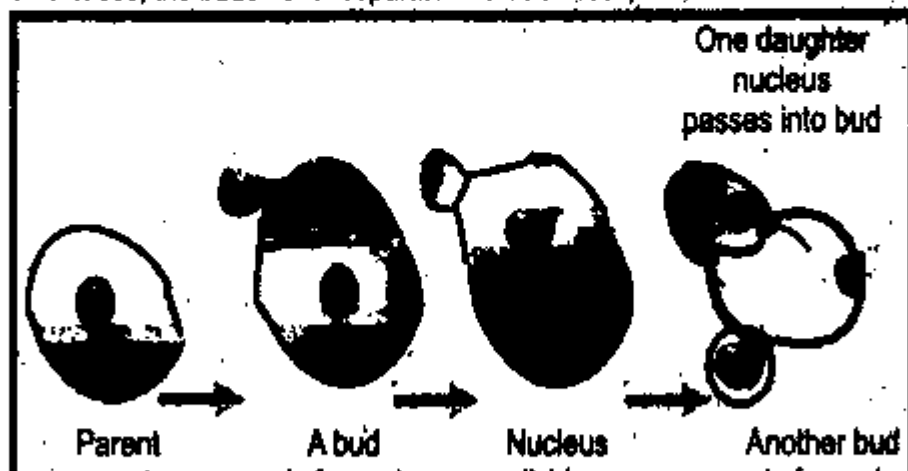
**Explanation:**

As certain worms grow to full size, they spontaneously break up into 8 or 9 pieces. Each piece (fragment) develops into a mature worm, and the process is repeated. If a planarian breaks into many pieces instead of two, it will also be called as fragmentation.

**Fragmentation in a planarian**

**b. Budding:**

A type of asexual reproduction in which a bud develops as a small outgrowth on parent's body and forms the new individual.

**Explanation:**

In case of yeast (a unicellular fungus) a small bud is formed on one side of cell. The nucleus of cell divides and one of the daughter nuclei is passed into the bud. Parent cell may form more than one bud at a time. Each bud enlarges and develops the characteristics of parent organism. The bud may separate from parent body. In some cases, the buds never separate and as a result, colonies of individuals are formed.

**Examples:**

**Budding in sponges, Hydra and corals:**

Animals such as sponges, Hydra and corals also reproduce by means of budding. In them, a small bud is formed on the side of body, by mitosis. This bud enlarges by the formation of more cells. It then detaches from the parent body and grows into new organism.

In corals, the buds do not detach from the parent body. Corals form big colonies, because the buds grow into new organisms by remaining attached to the parent body.

Budding in Hydra

**c. Spore Formation:**

**Sporangia:**

It is generally seen in most fungi (e.g. *Rhizopus*). When *Rhizopus* reaches reproductive age, its body cells form thick walled spore sacs called sporangia (sing, sporangium).

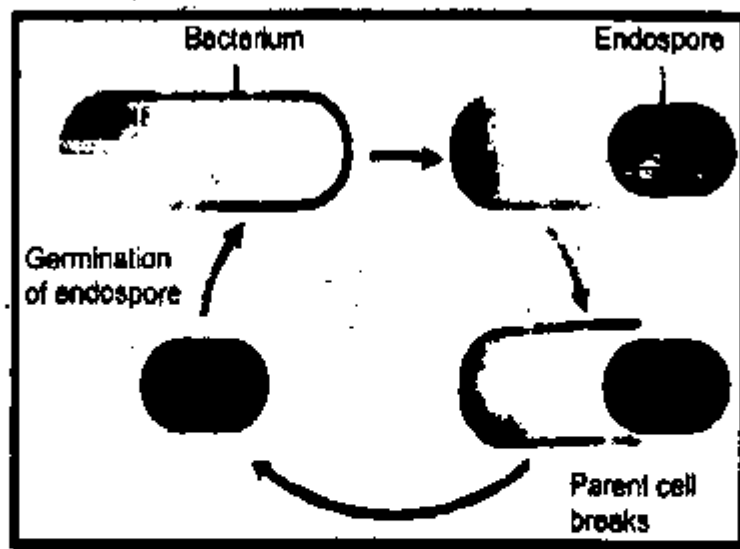
**Spores:** Inside each sporangium, a cell divides many times and forms many daughter cells called spores.

**Cyst:**

Each spore is covered with a thick wall called cyst and it can survive unfavourable conditions. When sporangia are mature, they burst and release spores. Under favourable conditions, the spores germinate and develop into new *Rhizopus*.

Spore formation in Rhizopus; Mature sporangium (left)brusts sporangium (right)

**Endospores:**

Under unfavourable conditions, some species of bacteria reproduce by forming spores, e.g. *Clostridium* and *Bacillus* species. The bacterial spores are also thick-walled. They are formed inside bacterial cells, so are called endospores.

Spore formation in a bacterium

**Q5. Write a note on the male and female reproductive systems of rabbit.**

**Ans:** **<u>Male reproductive system of rabbit:</u>**

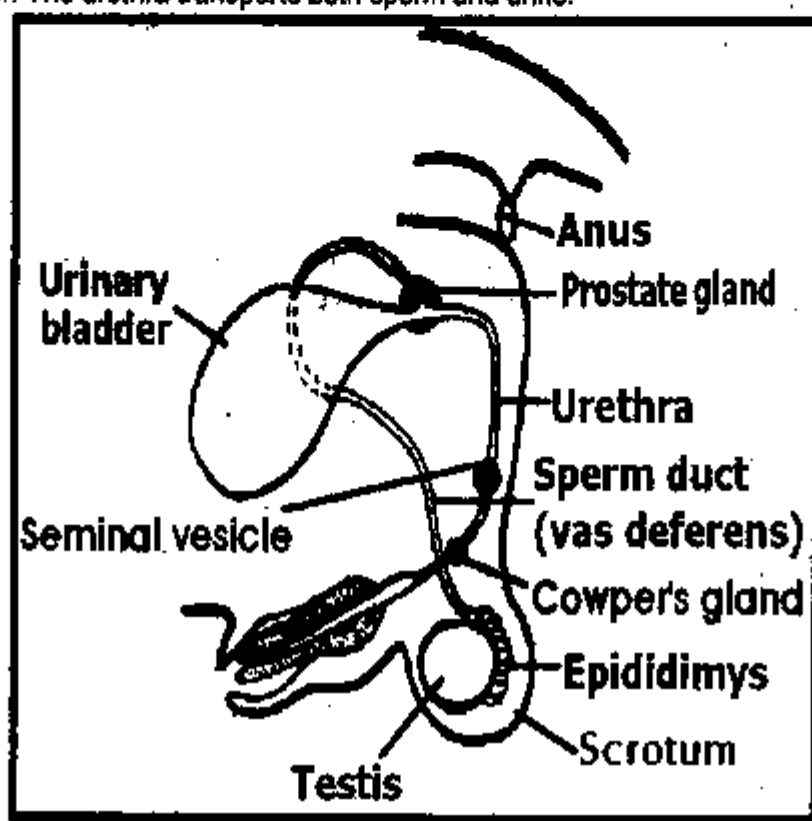
The male reproductive system of rabbit consists of a pair of testes that produce sperms, the associated

Each testis consists of a mass of coiled tubes called the seminiferous tubules. In these tubules, the sperms are formed.

**Epididimys:**

When sperm are mature, they accumulate in the collecting ducts of testes and then pass to epididimys.

**Vas deferens:**

From epididimys, sperms move to a sperm duct called vas deferens. Both sperm ducts join urethra just below urinary bladder. The urethra transports both sperm and urine.

Male reproductive system of rabbit

**Semen:**

Semen is the material containing sperms in a fluid. It consists of 10% sperms and 90% fluid. As the sperms pass down the ducts from testes to urethra, the associated glands add various secretions.

**Seminal vesicles:** Seminal vesicles produce secretions that provide nutrients for sperms.
**Prostate gland:** Prostate gland produces a secretion that neutralizes the acidity of the fluid.
**Cowper's glands:** Cowper's glands produce secretions that lubricate the ducts.

**Female Reproductive System:**

The female reproductive system of rabbit consists of ovaries and associated ducts.

**Ovaries:**

Ovaries are small oval organs situated in abdominal cavity just ventral to kidneys. Like most animals, female rabbits have a pair of ovaries. The outer region of ovary produces egg cells.

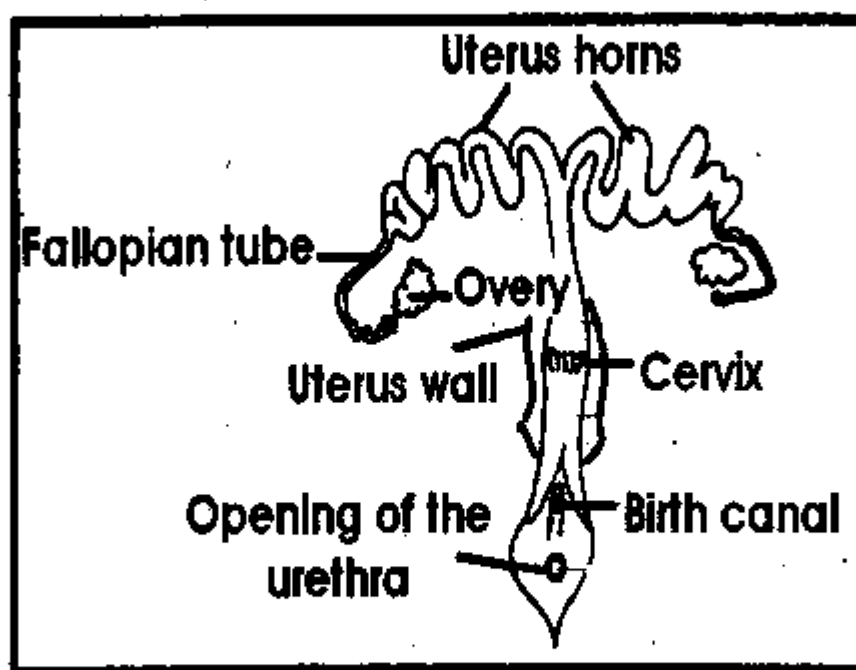
**Follicle:** A cluster of specialized cells called follicle surrounds and nourishes each egg cell.

**Fallopian tubes:**

From ovaries, egg cells are released in fallopian tubes. The opening of fallopian tube lies close to ovary. Fertilization occurs in fallopian tubes and the fertilized egg (zygote) is carried to uterus.

**Vagina or birth canal:**

The uterus of rabbit is divided into two separate parts or horns. The uterus horns join and open into vagina or birth canal.

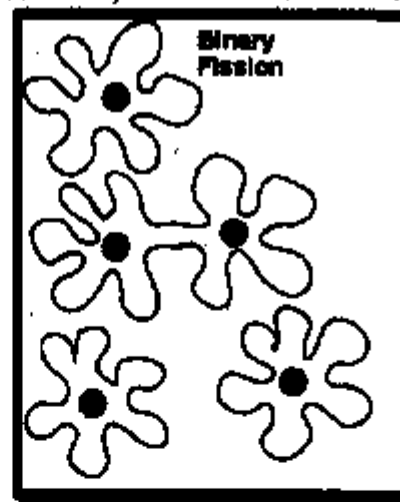
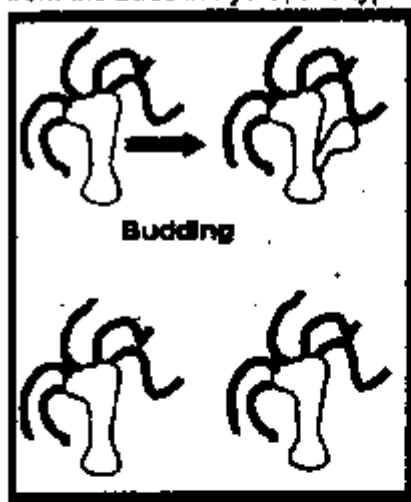
**Cervix:**

Femal reproductive system of rabbit

**Q6. a. Outline the methods of asexual reproduction in animals.**

**Ans. Asexual Reproduction in animals:**

The type of reproduction in which only a single parent is involved is called asexual reproduction e.g. budding and binary fission.

**Budding:**

In each hydra, there may be one or more bulges. These bulges are the developing new individuals and they are called buds. In hydra too the new individuals develop as outgrowths from a single parent. Since new individuals develop from the buds in hydra, this type of asexual reproduction is called budding.

**Binary fission:**

Another method of asexual reproduction is observed in the microscopic organism, amoeba. Amoeba is a single-celled organisms. It begins the process of reproduction by the division of its nucleus into two nuclei. This is followed by division of its body into two, each part receiving a nucleus. Finally, two amoebae are produced from one parent amoeba. This type of asexual reproduction in which an animal reproduces by dividing into two individuals is called binary fission.

**b. Describe the processes of spermatogenesis and oogenesis.**

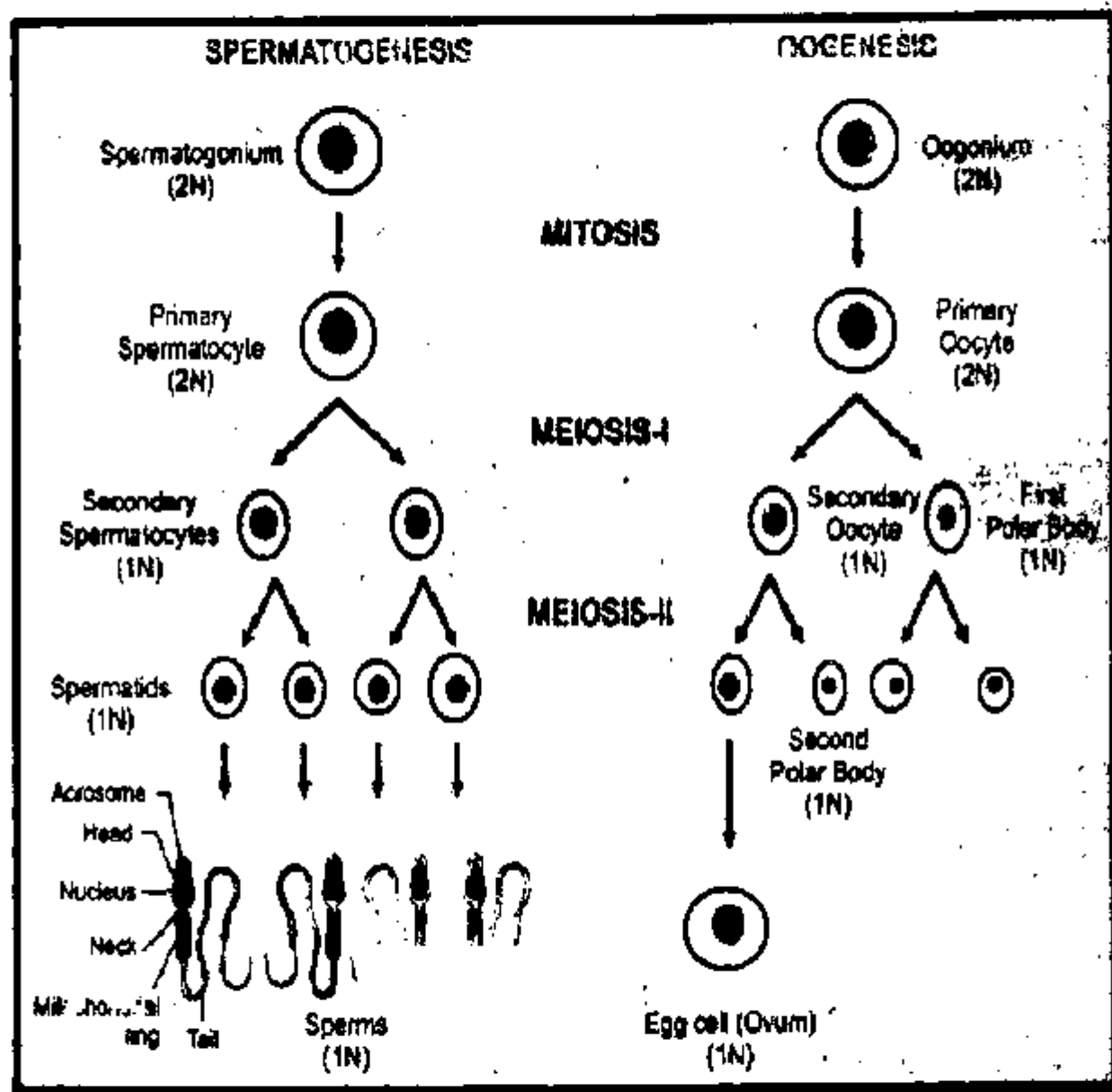
**Ans. Spermatogenesis:**

Some cells present in the walls of the seminiferous tubules of testes divide repeatedly by mitosis to form large number of diploid spermatogonia.

**Spermatids:**

The spermatids are non-motile and many changes occur in them to convert them into motile cells. Their nuclei shrink and some structures are formed e.g. a corner called acrosome, a tail and a mitochondrial ring. After these changes, the spermatids are called **sperms.**

**Oogenesis:**

Some cells of ovary prepare structures called follicles, in which many diploid oogonia are present. Some oogonia produce diploid primary oocytes. One of the primary oocytes completes meiosis-I and produces two haploid cells. The smaller cell is called first polar body and the larger one is called secondary oocyte. The secondary oocyte completes meiosis-II and produces two haploid cells i.e. a second polar body and an egg cell.

Gametogenesis in animals

# GUESS PAPER & MODEL PAPER # 5
## BASED ON CHAPTER # 15 (Reduced Syllabus)
## INHERITANCE

**NOTE:**

1. Only topic based relevant MCQs. Short and Long Questions are included.
2. All information in side boxes is excluded.

| Chapter Name | Topics Included |
|---|---|
| **Inheritance (Chapter # 14)** | Introduction to Genetics (94)<br>Chromosome and Genes (94-98)<br>Mendel's Laws of Inheritance (90-101) |

## SECTION – A (Marks 12)

**Time Allowed: 20 minutes** **Total Marks: 12**

**Note:** Section-A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

**Q.1 Encircle the correct option i.e. A / B / C / D. All parts carry equal marks.**

i. **An organism's expressed physical trait, such as seed colour or pod shape, is called its;**
A. Genotype B. Phenotype C. Karyotype D. Physical type

ii. **An organism has two different alleles for a single trait. Its genotype is said to be;**
A. fmozygous B. Heterozygous C. mizygous D. Homologous

iii. **In the cross-pollination between a true-breeding yellow pod plant and a true-breeding green plant, where green pod colour is dominant, the resulting offsprings (F1 generation) will be:**
A. 1/4 green, 3/4 yellow B. All yellow
C. 1/4 yellow, 3/4 green D. All green

iv. **How many genetically different kinds of gametes an individual with genotype AAbb can produce?**
A. 1 B. 2 C. 4 D. 8

v. **Which of the following statements regarding genes is FALSE?**
A. Genes are located on chromosomes
B. Genes consist of a long sequence of DNA
C. A gene contains information for the production of a protein
D. Each cell contains a single copy of every gene

vi. **Mendel's primary contribution to our understanding of inheritance was;**
A. The idea that genes are found on chromosomes
B. Explanation of the patterns of inheritance
C. The discovery of alleles
D. Determining that informations contained in DNA are for protein synthesis

vii. **A purple-flowered pea plant has the genotype PP. Which of the following statements about this plant is FALSE?**
A. Its phenotype will be white flowers
B. It has a homozygous dominant genotype

viii. **Charles Darwin proposed that organisms produce many more offspring than can possible survive on the limited amount of resources available to them. According to Darwin, the offspring that are most likely to survive are those that;**
A. Are born first and grow fastest B. Are largest and most aggressive
C. Have no natural predators D. Are best adapted to the environment

ix. **What is the dominance relationship between blood group alleles $I^A$ and $I^A$?**
A. Incomplete dominance B. Co –dominance
C. Recessive D. dominant over

x. **Mendel used ________ pea plants in his experiments.**
A. 26,000 B. 27,000 C. 28,000 D. 29,000

xi. **The allele i does not produce any antigen and the phenotype is blood group O.**
A. i B. $I^A$ C. $I^B$ D. None of these

xii. **The term "true-breeding" means homozygous.**
A. Homozygous B. Monohybrid C. Genotype D. Phenotype

# BIOLOGY SSC-II

**Time allowed: 2:40 Hours** **Total Marks: 53**

**NOTE: Answer any six parts from Section 'B' and attempt any five parts from Section-C. Attempt any two questions from Section 'D' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.**

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 x 3 = 18)**

ii. **What do you mean by dominant and recessive alleles?**
iii. **What are the homozygous and heterozygous genotypes?**
iv. **Describe the structure of chromatin.**
v. **Define the following terms: i. Inheritance ii. Genetics iii. Genes**
vi. **Write a note on the formation of Chromosomes and Genes.**
vii. **Briefly explain Watson-Crick Model of DNA.**
viii. **What do you know about the Replication of DNA?**

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 x 3 = 15)**

i. **Write a note on the structure of DNA.**
ii. **What do you mean by albinism and albino? How pigment will produce?**
iii. **Give introduction of Gregor Mendel.**
iv. **How Mendel proposed "special factors" in organisms?**
v. **Give the argue of Mendel for genetic experiments?**
vi. **Why Mendel selected the pea plant for his experiments?**
vii. **What do you mean by Punnett square?**

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks.**
**(2 x 10 = 20)**

**Q4. Describe Mendel's law of segregation.**

# SOLUTION OF GUESS PAPER & MODEL PAPER # 5

## SECTION- A (MCQs)

| i. B | ii. B | iii. D | iv. B | v. D | vi. B |
|---|---|---|---|---|---|
| vii. A | viii. D | ix. B | x. C | xi. A | xii. A |

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 x 3 = 18)**

**i. Define genotype and phenotype.**

**Ans: Genotype:** The specific combination of genes in an individual is known as genotype.

**Types:** It is of two types i.e. homozygous and heterozygous.

**Concept of Genotype:**

In order to understand the concept of genotype, let us consider an example trait i.e. albinism (a condition in which normal body pigments are absent). Like other traits, it is also controlled by one pair of genes. We can represent the two alleles of the pair as 'A' and 'a'. Three combinations i.e. genotypes are possible for these two alleles i.e. AA, Aa, and aa. These genotypes can be grouped into two types.

**Phenotype:**

A phenotype is the composite of an organism's observable characteristics or traits, such as its morphology, development, biochemical or physiological properties, phenology, behavior, and products of behavior (such as a bird's nest).

Phenotypes result from the expression of an organism's genes as well as the influence of environmental factors and the interactions between the two.

The physical appearance or biochemical characteristic of an organism as a result of the interaction of its genotype and the environment.

The expression of a particular trait, for example, skin color, height, behavior, etc., according to the individual's genetic makeup and environment.

**genotype + environment + random variation →*phenotype*.**

**ii. What do you mean by dominant and recessive alleles?**

**Ans: Dominant alleles:**

When in the heterozygous condition one allele masks or prevents the expression of the other, it is called the dominant allele.

**Recessive alleles:**

The allele which is not expressed is called recessive. The dominant alleles are represented by capital letters and recessive alleles by lower case letters.

**iii. What are the homozygous and heterozygous genotypes?**

**Ans: Homozygous genotypes:**

The genotype in which the gene pair contains two identical alleles (AA or aa), is called homozygous genotype.

**Heterozygous genotypes:**

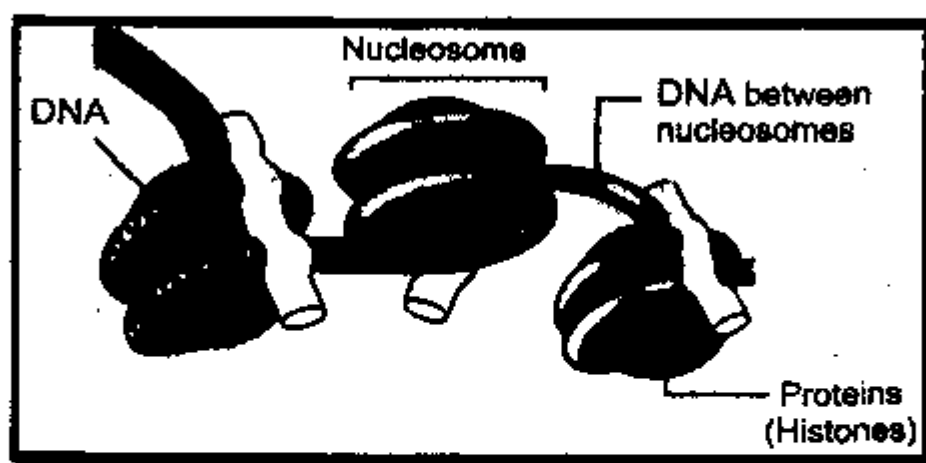
The genotype in which the gene pair contains two different alleles (Aa), is called heterozygous genotype.

**iv. Describe the structure of chromatin.**

**Ans: Structure of chromatin:**

Chromosome is made of chromatin material (simply as chromatin). Chromatin is a complex material, made of DNA and proteins (mainly histone proteins).

**Nucleosomes:**

DNA wraps around histone proteins and forms round structures, called nucleosomes. DNA is also

Chemical compostion of chromosome

**v. Define the following terms: i. Inheritance ii. Genetics iii. Genes**

**Ans: i. Inheritance:**

The transmission of characteristics from parents to offspring is called inheritance.

**ii. Genetics:**

Genetics is the branch of biology. Inheritance means the transmission of characteristics from parents to offspring. These characteristics are called the **traits.**

**iii. Genes:** The chromosomes carry the units of inheritance called the genes.

**vi. Write a note on the formation of Chromosomes and Genes.**

**Ans: Formation of Chromosomes:**

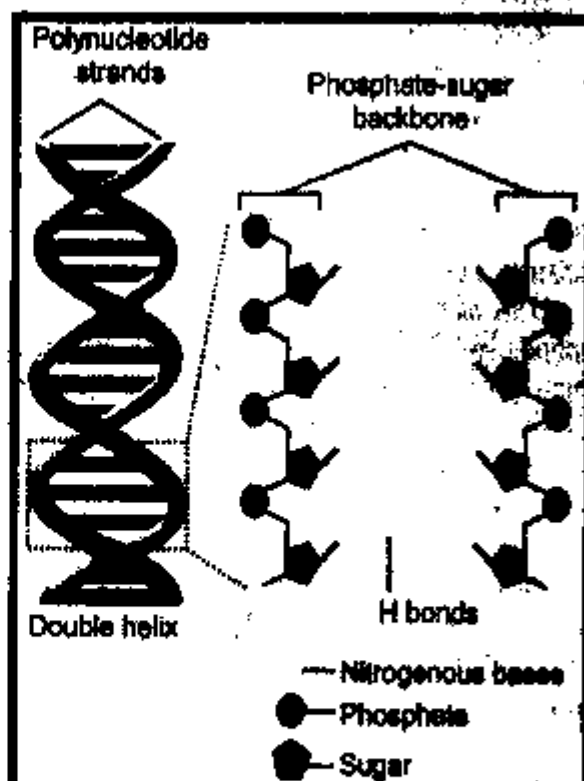
The body cells have a constant number of paired chromosomes. The two chromosomes of a pair are known as homologous chromosomes. In humans body cells, there are 23 pairs of homologous chromosomes for a total of 46 chromosomes. During meiosis, the two members of each chromosome pair separate and each of them enters one gamete.

**Formation of Genes:** Genes consist of DNA. They contain specific instructions for protein synthesis.

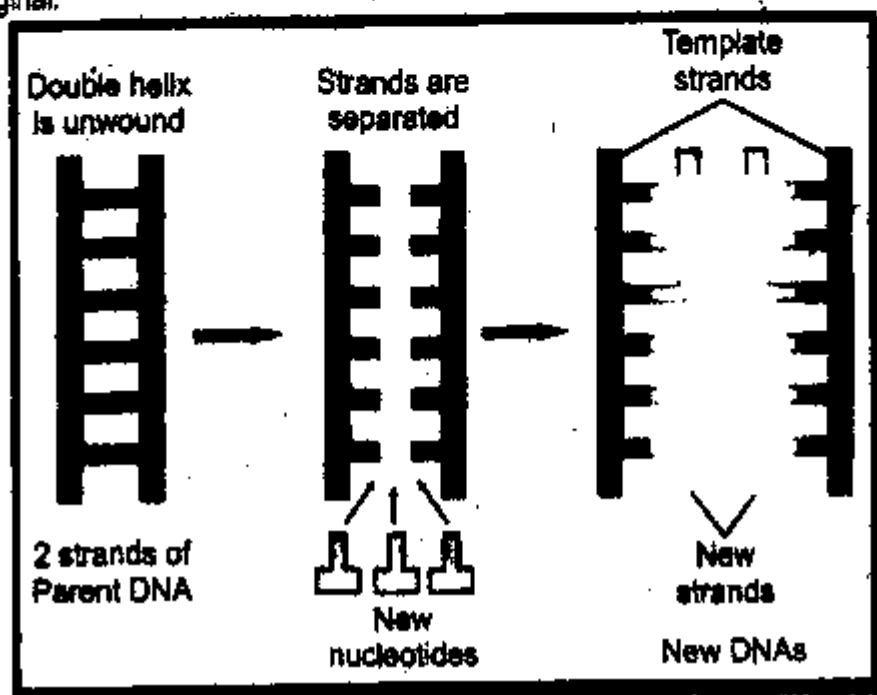
**vii. Briefly explain Watson-Crick Model of DNA.**

**Ans: Watson-Crick Model of DNA:**

In 1953, James Watson and Francis Crick proposed the structure for DNA. According to the Watson-Crick model, a DNA molecule consists of two polynucleotide strands. These strands are coiled around each other in the form of a double helix. There is a phosphate-sugar backbone on the outside- of double helix, and the nitrogenous bases are on the inside.

In double helix, the nitrogeneus bases of opposite nucleotides form pairs through hydrogen bonds. This pairing is very specific. The nitrogenous base adenine of one nucleotide forms pair with the thymine of opposing nucleotide, while cytosine forms pair with guanine. There are two hydrogen bonds between adenine and thymine while there are three hydrogen bonds between cytosine and guanine.

**viii. What do you know about the Replication of DNA?**

**Ans: Replication of DNA:**

Before a cell divides, its DNA is replicated (duplicated). It is done to make the copies of the chromatids of chromosomes. During replication, the DNA double helix is unwound and the two strands are separated, much like the two sides of a zipper. Each strand acts as a template to produce another strand. Its N-bases make pairs with the N-bases of new nucleotides. In this way, both template strands make new polynucleotide strands in front of them. Each template and its new strand together then form a new DNA double helix, identical to the original.

how does dna replicate itself

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks.** **(5 × 3 = 15)**

**i. Write a note on the structure of DNA.**

**Ans: Function of DNA:**

DNA is the genetic material i.e. it contains the instructions to direct all the functions of cells. It performs its role by giving instructions for the synthesis of specific proteins. Some proteins perform structural roles while the others act as enzymes to control all biochemical reactions of cells. In this way, whatever a cell does, is actually controlled by its DNA. In other words, DNA makes the characteristic or trait of cell or organism.

**Structure of DNA:**

DNA is a right handed double helix. It is made up of nucleotides that are bound to each other by phosphodiester bonds. It consists of a phosphorous group, and deoxyribose sugar, and a base (Adenine, Guanine, Cytosine, Thymine) Adenine and Guanine are Purines, and the other two are Pyrimidines.

The bases are "connected" to each other by hygrogen bonding. A::T G:::C each colon represents the number of H-bonds.

**ii. What do you mean by albinism and albino? How pigment will produce?**

**Ans: Albinism:**

Albinism is a recessive trait i.e. it is produced when both alleles are recessive. In humans, allele 'A' produces normal body pigments while allele 'a' does not produce pigments. If genotype is AA or Aa, the individual will produce pigments.

**Albino:**

On the other hand if genotype is aa, no pigments will be produced and the individual will be albino. In

**iii. Give introduction of Gregor Mendel.**

**Ans: Gregor Mendel:**

Gregor Mendel was a monk (priest) in Austria. He developed the fundamental principles of genetics. Mendel used 28,000 pea plants in his experiments.

**Special factors:**

Mendel proposed that there are "special factors" in organisms, which control the expression of traits and their transmission to next generations. These factors were eventually termed genes. Mendel selected pea plant (Pisum sativum) to carry out a large number of experiments. In his writings, he gave reasons for this selection.

**iv. How Mendel proposed "special factors" in organisms?**

**Ans: Special factors:**

Mendel proposed that there are "special factors" in organisms, which control the expression of traits and their transmission to next generations. These factors were eventually termed genes. Mendel selected pea plant (Pisum sativum) to carry out a large number of experiments. In his writings, he gave reasons for this selection.

**v. Give the argue of Mendel for genetic experiments?**

**Ans:** Mendel argued that an organism for genetic experiments should have the following features:

i. There should be a number of different traits that can be studied.
ii. The organism should have contrasting traits e.g. for the trait of height there should be only two very different phenotypes i.e. tallness and dwarfness.
iii. The organism (if it is a plant) should be self-fertilizing but cross fertilization should also be possible.
iv. The organism should have a short but fast life cycle.

| Seed | | Flower | Pod | | Stem | |
|---|---|---|---|---|---|---|
| Form | Cotyledon | Color | Form | Color | Place | Size |
| Round | Yellow | White | Full | Green | Axial pods | Tall |
| Wrinkled | Green | Violet | Constricted | Yellow | Terminal pods | Short |

**vi. Why Mendel selected the pea plant for his experiments?**

**Ans: Selection of Pea plant:**

All these features are present in pea plant. Normally, the flowers of pea plant allow self-pollination. Cross pollination can also be done by transferring the pollen grains from the flower on one plant to the flower on another plant. Each trait studied in pea plant had two distinct forms.

**vii. What do you mean by Punnett square?**

**Ans: Punnett square:**

The Punnett square is a diagram that is used to predict an outcome of a particular cross or breeding experiment. It is named after R.C. Punnett (an English mathematician).

The gametes of both parents having all possible genetic set-ups are determined. A checker board is used to cross all the possible gametes of one parent with all the gametes of other parent. In this way, a biologist can find all the possible genotypes of offsprings.

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks.**

**(2 × 10 = 20)**

**Q4. Describe Mendel's law of segregation.**

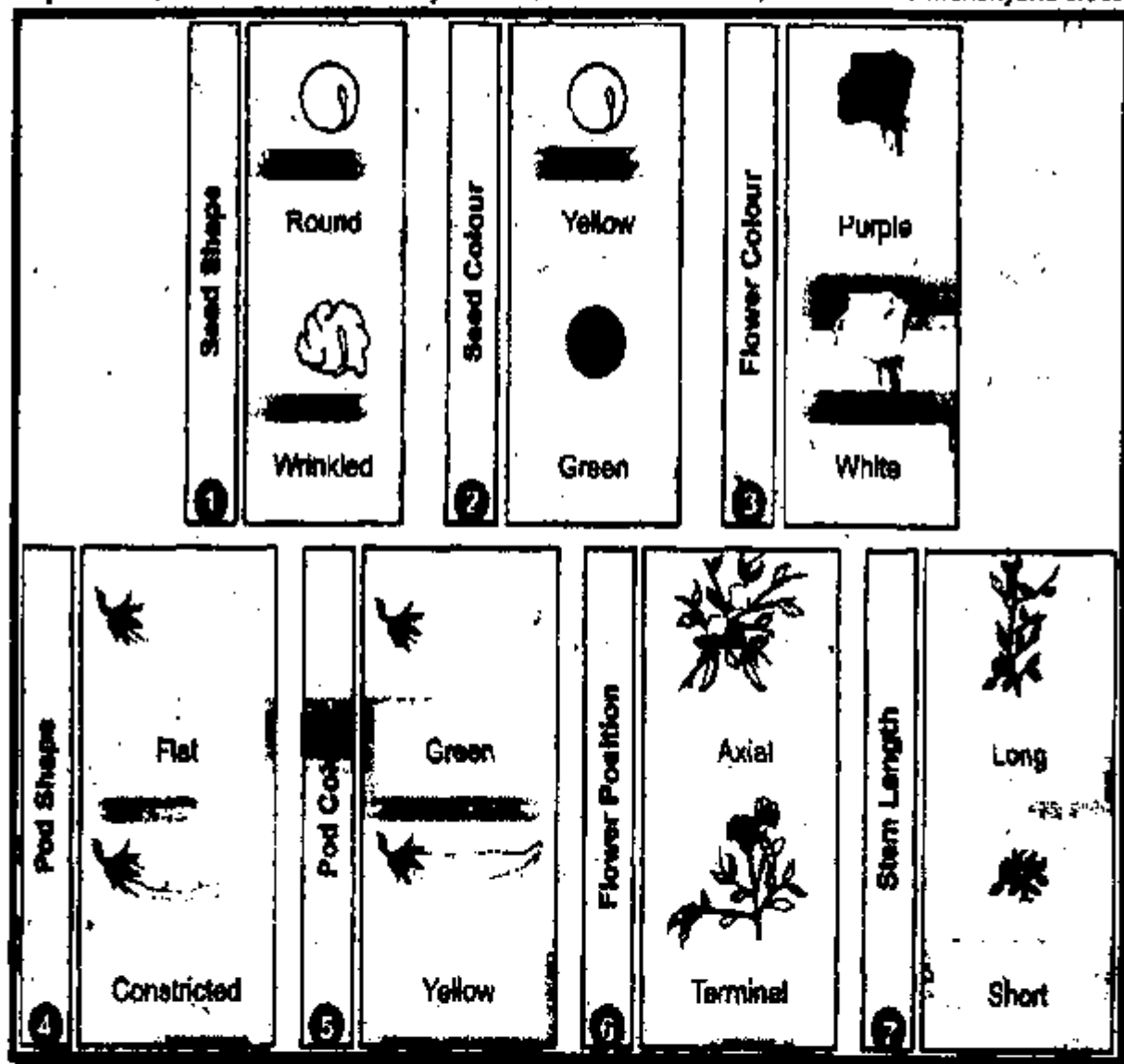
**Ans. Mendel's Law of Segregation:**

Mendel's law of segregation states that alleles of genes separate when gametes are formed. This applies to the segregation of alleles of one gene.

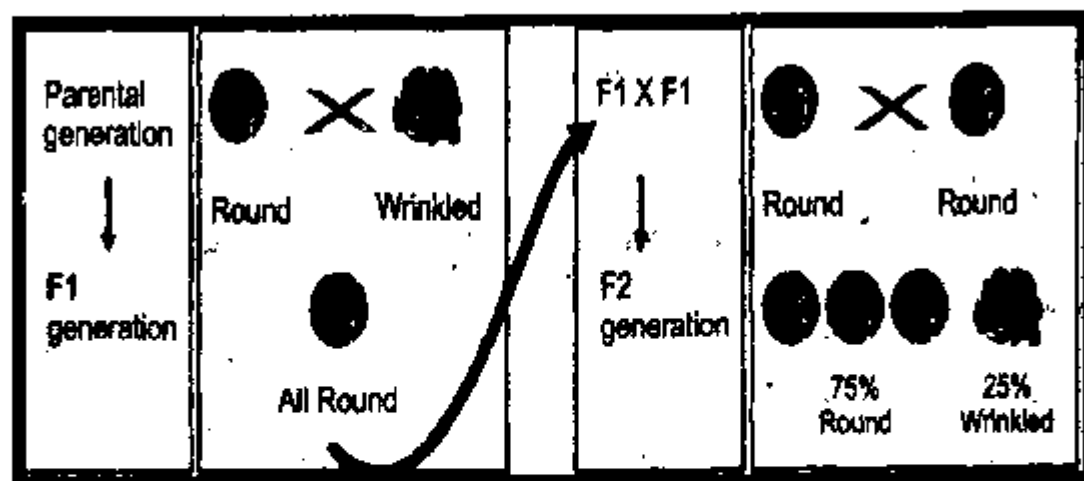
Mendel's Law of Segregation applies to two (or more) alleles (alternative versions of a gene). The law says that alleles segregate (separate from each other) at some point before the formation of gametes, and are combined randomly at fertilization.

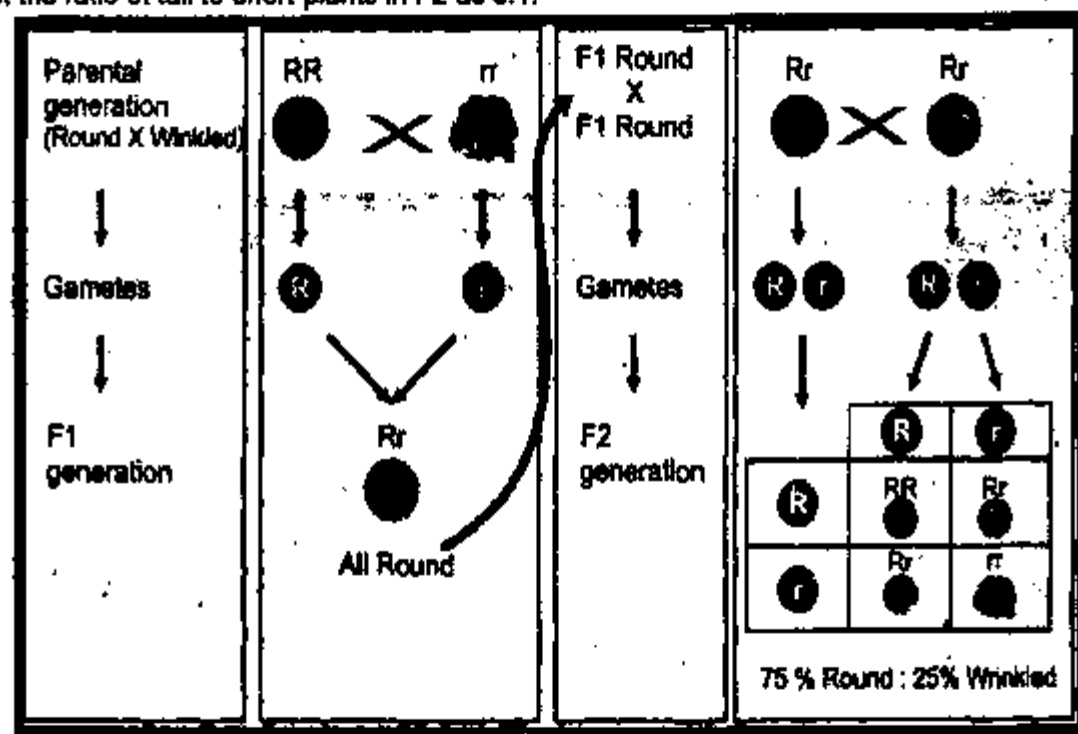
**Explanation:**

Mendel studied the inheritance of seed shape first. For this purpose, he crossed (reproduced) two plants having one contrasting trait i.e. seed shape.

**Monohybrid cross:** A cross in which only one trait is studied at a time, is called as a monohybrid cross.

Traits in pea plant studied by mendel

**Case 1:**

Mendel crossed a true-breeding round-seeded plant with a true-breeding wrinkled-seeded plant. All resulting seeds of the next generation were round. Mendel declared the trait "round seeds" as dominant, while "wrinkled seeds" as recessive. The following year, Mendel planted these seeds and allowed the new plants to

**Case 2:**

Similarly, when "true-breeding" tall plants were crossed with "true-breeding" short plants, all offspring of F1 were tall plants i.e. tallness was a dominant trait. When members of F1 generation were self-fertilized, Mendel got the ratio of tall to short plants in F2 as 3:1.

**Conclusion:**

Mendel concluded that the traits under study were controlled by discrete (separable) factors or genes. In each organism, the genes are present in pairs. During gamete formation, the genes (alleles) of each pair segregate from each other and each gamete receives one gene from the pair.

When the gametes of male and female parents unite, the resulting offspring again gets the genes in pairs. These conclusions were called the **Law of Segregation.**

**Q5. Explain how Mendel proved the law of independent assortment.**

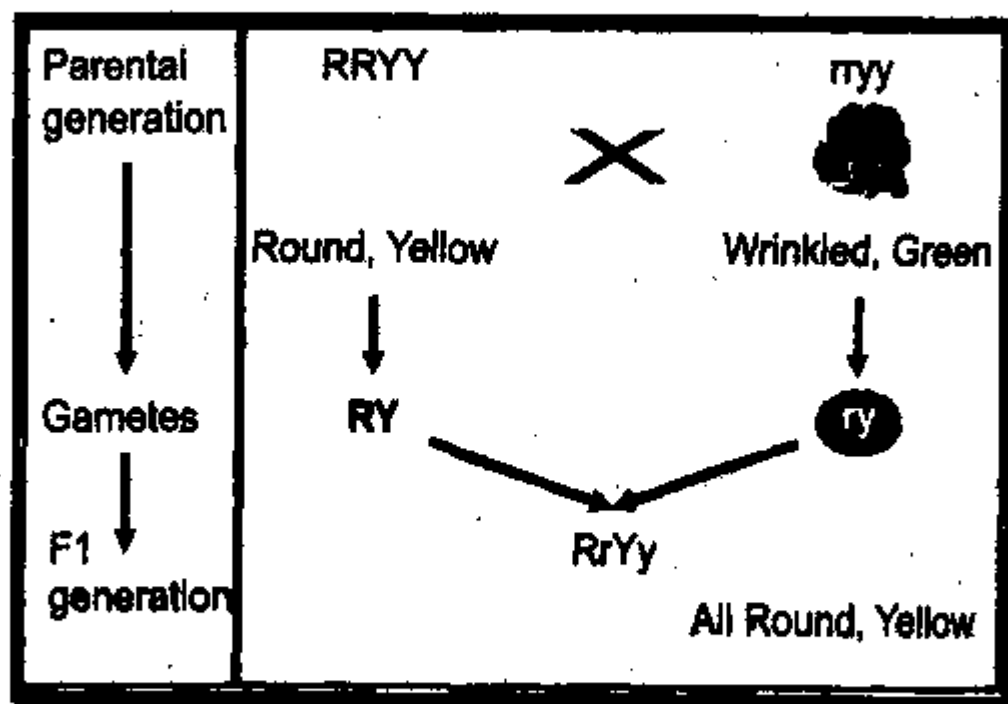
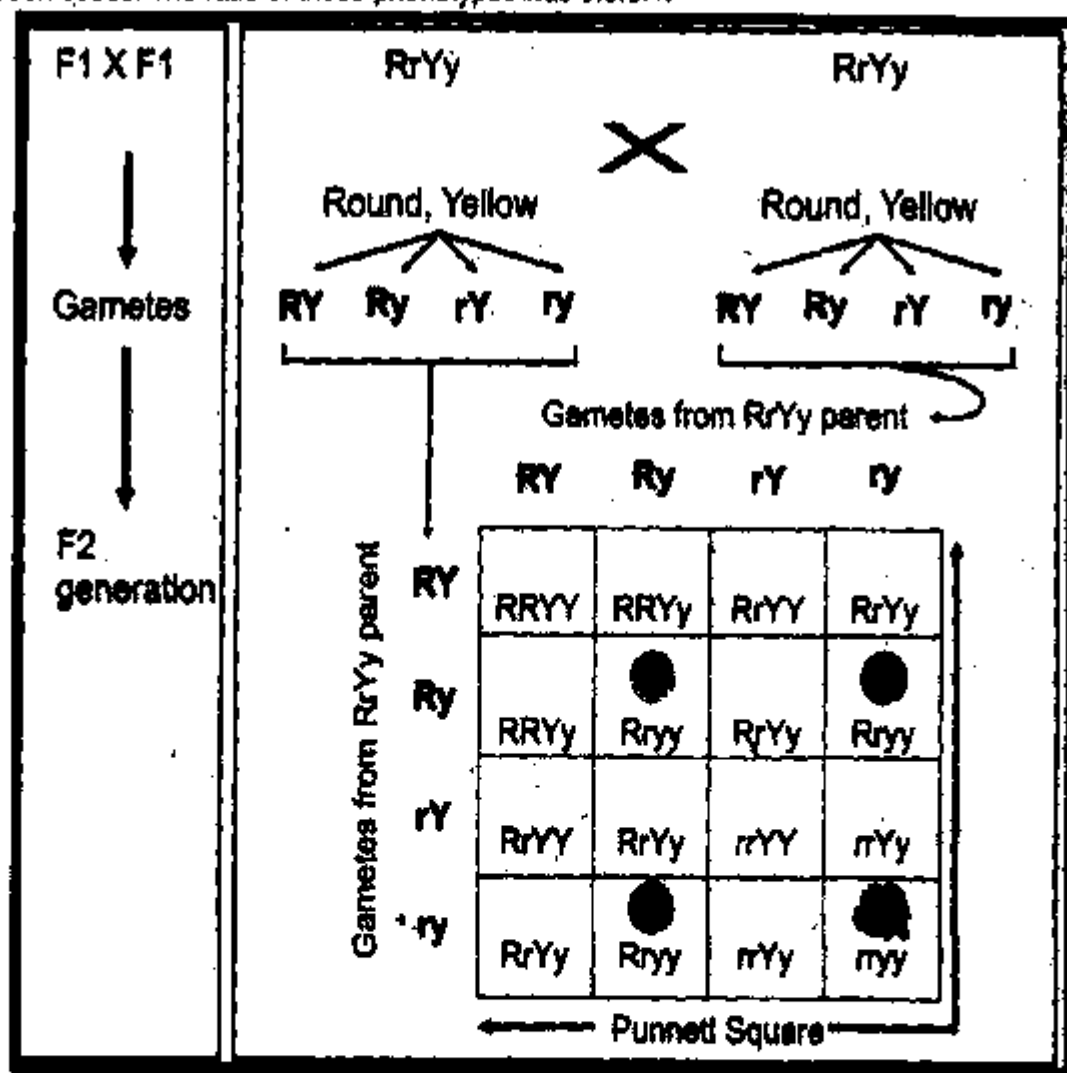
**Ans. Mendel's Law of Independent Assortment:**

It states as: "the alleles of a gene pair segregate (get separated and distributed to gametes) independently from the alleles of other gene pairs".

**Explanation:**

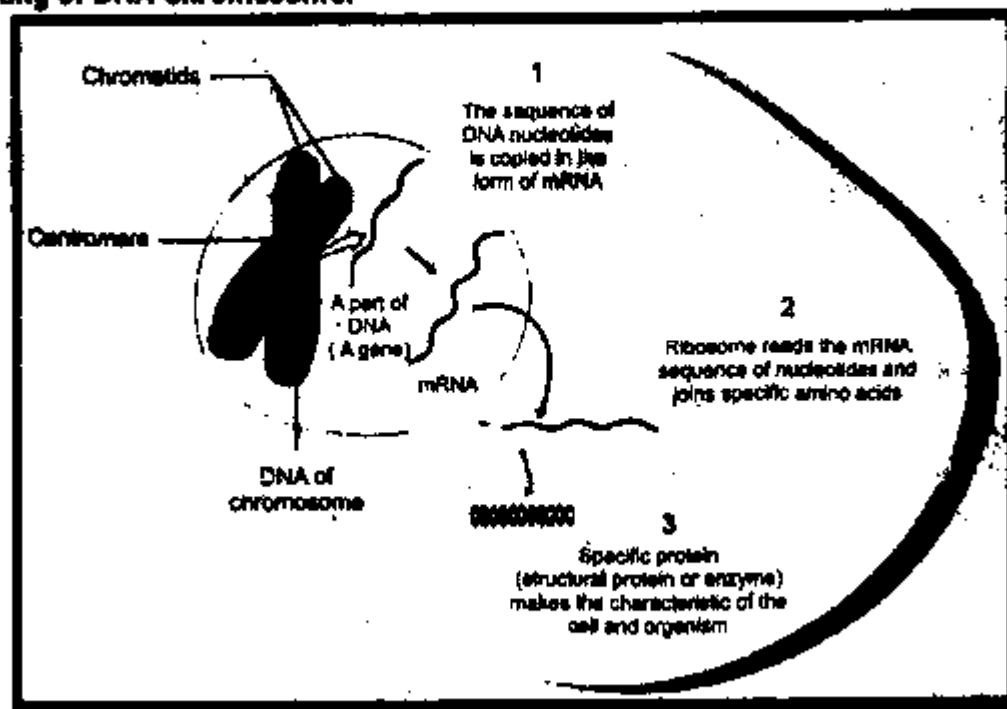
**Dihybrid crosses:**

In the next crosses, Mendel studied two contrasting traits at a time. Such crosses are called dihybrid crosses. He performed experiments on two seed traits i.e. shape and colour.

The trait of round seeds (controlled by allele R) was dominant over wrinkled (controlled by allele r).

When F1 seeds grew into plants, they were self-fertilized. This cross produced seeds with four phenotypes. There were 315 round yellow seeds, 108 round green seeds, 101 wrinkled yellow seeds and 32 wrinkled green seeds. The ratio of these phenotypes was 9:3:3:1.

**Conclusion:**

Mendel explained that the two traits i.e. seed shape and seed colour are not tied with each other. The

**Q6. How Does the DNA of Chromosome work?**

**Ans: Working of DNA Chromosome:**

Working of DNA (also called the Central Dogma)

Traits are made by **specific proteins**. **Specific proteins** have specific number and sequence of their amino acids. DNA controls **this sequence of amino acids by the sequence** of its nucleotides.

**Transcription:**

During protein synthesis, the sequence of DNA nucleotides decides that what will be the sequence of amino acids. For this purpose, the specific sequence of DNA nucleotides is copied in the form of messenger RNA (mRNA) nucleotides. This process is called transcription.

**Translation:**

The mRNA carries the sequence of its nucleotides to ribosome. The ribosome **reads this sequence and** joins specific amino acids, according to it, to form protein. This step is known as translation.

**Gene:**

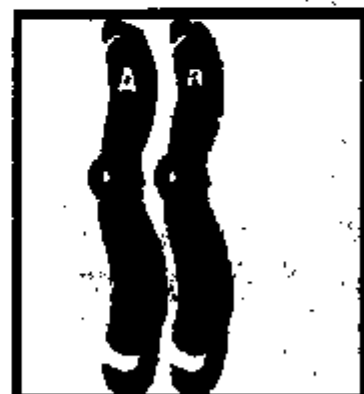
The part of DNA (sequence of nucleotides) that contains the instructions for the synthesis of a particular protein is known as a gene. DNA of each chromosome contains thousands of genes. Like chromosomes, genes also occur in pairs, one on each homologous chromosome.

**Loci:**

The locations or positions of genes on chromosomes are known as loci (Singular, locus). Some individuals (a condition which we may represent as AA or aa or BB) and different in others (Aa or Bb). It means that a gene exists in more than one alternate form. In the above example, 'A and 'a' are the two alternate forms of a gene and 'B' and 'b' are the alternate forms of another gene.

**Alleles:**

The alternate forms of a gene are called alleles. If an individual has Aa gene pair, 'A and 'a' are the alleles of one another. In this individual, allele 'A' is located on one of the two homologous chromosomes and the allele 'a' is on the other chromosome.

When chromosomes **separate during** meiosis, **alleles also separate** and each gamete gets one of **the two alleles**. When gametes of both parents unite, the zygote (and the offspring also) receives one allele from each parent.

# GUESS PAPER & MODEL PAPER # 6
## BASED ON CHAPTER # 16 & 17 (Reduced Syllabus)
# MAN AND HIS ENVIRONMENT
# BIOTECHNOLOGY

**NOTE:**

1. **Only topic based relevant MCQs. Short and Long Questions are included.**
2. **All information in side boxes is excluded.**

| Chapter Name | Topics Included |
|---|---|
| **Man and His Environment (Chapter # 16)** | Components of Ecosystem (114)<br>Biogeochemical Cycles (119-121)<br>Interactions in Ecosystems (122-125) |
| **Biotechnology (Chapter # 17)** | Introduction to Biotechnology (138)<br>Fermentation (139-140)<br>Genetic Engineering (144-147) |

## SECTION – A (Marks 12)

**Time Allowed: 20 minutes** **Total Marks: 12**

**Note:** Section-A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

**Q.1 Encircle the correct option i.e. A / B / C / D. All parts carry equal marks.**

**i. Find the correct match for the fermentation product and the organism involved.**
A. Formic acid – Saccharomyces  B. Ethanol - Saccharomyces
C. Ethanol – Aspergillus  D. Glycerol - Aspergillus

**ii. Which one is NOT an objective of genetic engineering?**
A. Production of cheese and yogurt by lactic acid bacteria
B. Isolation of a particular gene or part of a gene
C. Production of RNA and protein molecules
D. Correction of genetic defects in higher organisms

**iii. Which of these is an anti-viral protein?**
A. Urokinase  B. Thymosin  C. Insulin  D. Interferon

**iv. The first step in genetic engineering is;**
A. Growth of the genetically modified organism
B. Transfer of the Recombinant DNA into the host organism
C. Isolation of the gene of interest  D. Insertion of a gene into a vector

**v. Which of the following is the abiotic component of the ecosystem?**
A. Producers  B. Herbivores  C. Carnivores  D. Oxygen

**vi. When we eat onions, our trophic level is;**
A. Primary consumer  B. Secondary consumer
C. Decomposer  D. Producer

viii. In the food chain tree → caterpillar → robin → hawk → coyote, which is the secondary consumer?
A. Caterpillar B. Robin C. Hawk D. Coyote

ix. In ecosystems, the flow of______ is one way, while______ is/are constantly recycled.
A. Minerals, energy B. Energy, minerals
C. Oxygen, energy D. Glucose, water

x. In the food chain "grass → rabbit → fox → bear → mushroom", how many types of decomposers are present?
A. 1 B. 2 C. 3 D. 4

xi. Organisms in the ecosystem that are responsible for the recycling of plant and animal wastes are:
A. Producers B. Consumers C. Decomposers D. Competitors

xii. Which form of Nitrogen is taken by the producers of the ecosystem?
A. Nitrogen gas B. Ammonia C. Nitrites D. Nitrates

# BIOLOGY SSC-II

**Time allowed: 2:40 Hours** **Total Marks: 53**

NOTE: Answer any six parts from Section 'B' and attempt any five parts from Section-C. Attempt any two questions from Section 'D' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)**

i. Define ecosystem and its components.
ii. Explain how biotic components are further classified?
iii. How would you describe biogeochemical cycles?
iv. Define nitrogen cycle.
v. Differentiate between intraspecific and interspecific interactions in ecosystem.
vi. Describe the symbiosis between honeyguide bird and badger?
vii. Write a note on Carbon cycle.
viii. How would you define fermentation with reference to biotechnology?

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)**

i. In biotechnology, what is meant by Genetically Modified Organism (GMO)? How is it made?
ii. What basic steps a genetic engineer adopts during the manipulation of genes?
iii. Write a note on Genetic engineering.
iv. Briefly explain the process of fermentation:
v. Give introduction and objectives of genetic engineering.
vi. What are single cell proteins? Describe their importance.
vii. Define biotechnology.

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks. (2 × 10 = 20)**

Q4. What are the different stages of Nitrogen cycle?
Q5. Write notes on competition, predation and symbiosis.
Q6. a. Define biotechnology and describe its [illegible]

# SOLUTION OF GUESS PAPER & MODEL PAPER # 6

## SECTION- A (MCQs)

| i. B | ii. A | iii. D | iv. C | v. D | vi. A |
|---|---|---|---|---|---|
| vii. C | viii. B | ix. B | x. A | xi. C | xii. D |

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)**

**i. Define ecosystem and its components.**

**Ans:** The self-sufficient unit of an environment that is formed as a result of interactions between its biotic community and the abiotic components is known as an **ecosystem.**

**Components of Ecosystem:** Ecosystem comprises of two basic parts i.e.

**a.** Abiotic Components **b.** Biotic Components

**Abiotic components:**

The **abiotic components** include the non-living factors present in ecosystem. The important non-living factors are light, air, water, soil and the basic elements and compounds.

**Biotic Components:**

The **biotic components** comprise the living part (organisms) of the ecosystem. Biotic components are further classified as producers, consumers and decomposers.

**ii. Explain how biotic components are further classified?**

**Ans: Classification of Biotic Components:**

**i. Producers:**

The producers are the autotrophs present in an ecosystem. Producers include plants, algae and photosynthetic bacteria. These organisms are able to synthesize complex organic compounds (food) from inorganic raw materials. Producers form the basis of any ecosystem.

In terrestrial ecosystems, plants are the main producers. In aquatic ecosystems, the main producers are the floating photosynthetic organisms (mainly algae) called phytoplankton and shallow water rooted plants.

**ii. Consumers:**

The consumers are heterotrophs. They cannot synthesize their food and so depend upon producers for food. Consumers iñclude all animals, fungi, protozoans and many of the bacteria. The animals are the major consumers of ecosystems.

**Classification of Consumers:**

They are further classified as herbivores and carnivores.

**a. Primary Consumers (Herbivores):**

Herbivores e.g. cattle, deer, rabbit, grasshopper etc. feed on plants. They are the primary consumers. They feed directly on plants or products of plants.

**b. Secondary Consumers (Carnivores):**

Carnivores feed on other animals. Primary carnivores (secondary consumers) feed on herbivores. Fox, frog, predatory birds, many fishes and snakes etc. are primary carnivores.

**c. Tertiary Consumers (Secondary carnivores):**

Secondary carnivores (tertiary consumers) feed on primary carnivores. Wolf and owl etc. are secondary carnivores. Tertiary carnivores e.g. lion, tiger etc. feed on secondary carnivores.

**iii. Decomposers or reducers:**

Decomposers or reducers break down the complex organic compounds of dead matter (of plants and animals) into simple compounds. They secrete digestive enzymes into dead and decaying plant and

**iii. How would you describe biogeochemical cycles?**

**Ans: Biogeochemical Cycles:**

Biogeochemical cycles are the cyclic pathways through which materials move from environment to organisms and back to environment.

Environment is the source of materials for all living organisms. Environment provides bioelements which are used by organisms for their bodies and metabolism. The materials are continuously recycled between organisms and environment.

**Carbon cycle:** The biogeochemical cycle in which carbon flows between organisms and the environment.

**Nitrogen cycle:** The flow of nitrogen between environment and the organisms

**Nutrient Cycles:**

Since such movement of elements and inorganic compounds is essential for maintenance of life, they are also called 'nutrient cycles'.

**iv. Define nitrogen cycle.**

**Ans: Nitrogen cycle:**

The flow of nitrogen between environment and the organisms is called nitrogen cycle.

Nitrogen is an important component of many biomolecules, like proteins and nucleic acids (DNA and RNA). Atmosphere is the reservoir of free gaseous nitrogen. Living organisms cannot pickup this gaseous nitrogen directly from atmosphere (except for nitrogen fixing bacteria). It has to be converted into nitrates to be utilised by plants.

**v. Differentiate between Intraspecific and Interspecific interactions in ecosystem.**

**Ans: Intraspecific interactions in ecosystem.**

The interactions between the members of the same species are called intraspecific interactions.

**Interspecific interactions in ecosystem:**

The interactions between the members of different species are called interspecific interactions. Some important interactions among living organisms in ecosystems are given below.

i. Competiton ii. Predation iii. Symbiosis

**vi. Describe the symbiosis between honeyguide bird and badger?**

**Ans:** The honeyguide bird feeds on wax and the larvae present in honeycombs. It flies around looking for honeycombs, but it is not strong enough to open the comb. Badgers are large mammals that feed on honey. When a honeyguide bird goes to find honeycombs, the badger follows it. When the bird ' finds a honeycomb, it calls the badger.

Sometimes the bird has to stop and wait for the slow-moving badger. After reaching there, the badger opens the honeycomb and both of them eat their foods together. Traditionally, humans have also used these birds to find honeybee colonies.

**vii. Write a note on Carbon cycle.**

**Ans: Carbon cycle:**

The biogeochemical cycle in which carbon flows between organisms and the environment is called carbon cycle.

Carbon atom is the principal building block of many kinds of biomolecules. Carbon is found as graphite and diamond in nature. It also occurs as carbon dioxide in atmosphere.

**Major source of carbon:**

Major source of carbon for the living world is carbon dioxide present in atmosphere and water. Fossil fuels like peat, coal, natural gas and petroleum also contain carbon. Carbonates of Earth's crust also give rise to carbon dioxide.

**Photosynthesis and Carbon:**

The major process that brings carbon from atmosphere or water into living world is photosynthesis. Producers take in carbon dioxide from atmosphere and convert it into organic compounds. In this way, carbon becomes a part of the body of producers. This carbon enters food chains and is passed to herbivores, carnivores and decomposers.

**Respiration:**

**Combustion:** Burning of wood and fossil fuels also adds large amount of carbon dioxide into atmosphere.

**Green house effect and global warming:**

Human activities have contributed to the loss of balance in nature because the balance of carbon cycle has been upset by human activities such as deforestation and excessive burning of fossil fuels. As a result, the amount of carbon dioxide in atmosphere is increasing, causing the green house effect and global warming.

**Note:** Carbon cycle is a perfect cycle in the sense that carbon is returned to atmosphere as soon as it is removed.

**viii. How would you define fermentation with reference to biotechnology?**

**Ans: Fermentation:**

Fermentation is the process in which there is incomplete oxidation-reduction of glucose. Fermentation has been in the knowledge of man since centuries, but it was believed that it is purely a chemical process.

**Fermentation in Biotechnology:**

In beginning, the meaning of fermentation process was the use of microorganisms for the production of foods (cheese, yogurt, fermented pickles and sausages, soy sauce), beverages (beers, wines) and spirits. However, in biotechnology the term "fermentation" means the production of any product by the mass culture of microorganisms.

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)**

**i. In biotechnology, what is meant by Genetically Modified Organism (GMO)? How is it made?**

**Ans:** Recombinant DNA is transferred to the target host. In this way, host organism is transformed into a genetically modified organism (GMO).

The GMO are provided suitable culture medium for growth to give as much copies of the gene of interest as needed.

The GMO contains the gene of interest and manufactures the desired product, which is isolated from culture medium.

**ii. What basic steps a genetic engineer adopts during the manipulation of genes?**

**Ans: Basic Steps in Genetic Engineering:**

All the above mentioned objectives can be obtained by some basic methodologies, such as:

**i. Isolation of the gene of interest:**

In the first step, the genetic engineer identifies the gene of interest in a donor organism. Special enzymes, called restriction endonucleases, are used to cut the identified gene from the total DNA of donor organism.

**ii. Insertion of the gene into a vector:**

A vector is selected for the transfer of the isolated gene of interest to the host cell. The vector may be a plasmid (the extra-chromosomal DNA present in many bacteria) or a bacteriophage. The gene of interest is attached with the vector DNA by using endonuclease (breaking enzymes) and ligase Coining enzymes). The vector DNA and the attached gene of interest are collectively called **recombinant DNA.**

**iii. Transfer of recombinant DNA into host organism:**

Recombinant DNA is transferred to the target host. In this way, host organism is transformed into a genetically modified organism (GMO).

**iv. Growth of the GMO:**

The GMO are provided suitable culture medium for growth to give as much copies of the gene of interest as needed.

**v. Expression of the gene:**

The GMO contains the gene of interest and manufactures the desired product, which is isolated from culture medium.

**iii. Write a note on Genetic engineering.**

engineering started in 1944 when it was proved that DNA carries the genetic information. Scientists isolated the enzymes of DNA synthesis and then prepared DNA outside cells.

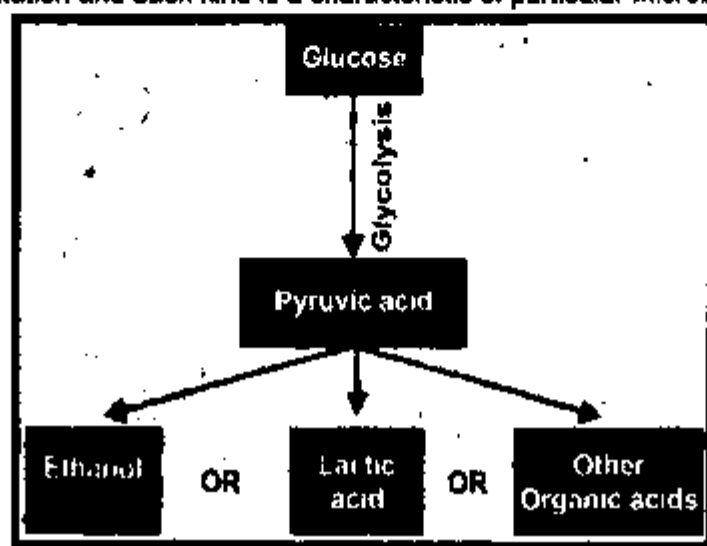
In 1970s, they were able to cut and paste the DNA of organisms. In 1978, scientists prepared human insulin by inserting the insulin gene in bacteria. Human growth hormone was also synthesized in bacteria.

In 1990, the **Human Genome Project** was launched to map all the genes in human cell. The complete map of human genome was published in 2002.

**iv. Briefly explain the process of fermentation:**

**Ans: Fermentation:**

The process in which there is incomplete oxidation-reduction of the organic substrate (glucose)

In 1857, Pasteur convinced the scientific community that all fermentations are the results of microbial activity. He showed that fermentation is always accompanied by the development of microorganisms. There are many kinds of fermentation and each kind is a characteristic of particular microbial group.

Carbohydrate fermentation and its products

Fermentations are classified in terms of the products formed. The initial steps of **carbohydrate fermentation** are identical to those of respiration. The process begins with glycolysis, in which the glucose, molecule is broken into two molecules of pyruvic acid. Different microorganisms proceed the further reactions in different ways. It results in the **formation of various** products from pyruvic acid.

**Types of Carbohydrates Fermentation:**

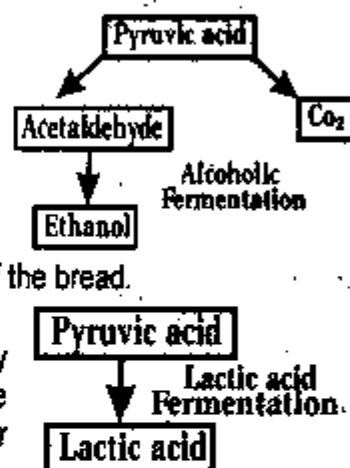
The two basic types of carbohydrate fermentation are:

**i. Alcoholic Fermentation (by yeast):**

This fermentation is carried out by many types of yeast such as *Saccharomyces cerevisiae*. This process is quite important and is used to produce bread, beer, wine and distilled spirits, in this process, carbon dioxide is removed from pyruvic acid. The product i.e. acetaldehyde is then reduced to ethanol. The carbon dioxide produced during this fermentation causes the rise of the bread.

**ii. Lactic Acid Fermentation (by bacteria):**

Pyruvic acid → Lactic acid Fermentation → Lactic acid

In this process, pyruvic acid is reduced to lactic acid. It is carried out by many bacteria e.g. Streptococcus and many Lactobacillus species. It is quite important in dairy industry where it is used for souring milk and also for production of various types of cheese.

**v. Give introduction and objectives of genetic engineering.**

**Ans: Introduction of Genetic Engineering:**

Genetic engineering or recombinant DNA technology involves the artificial synthesis, modification, removal, addition and repair of the genetic material (DNA). Genetic engineering developed in the mid-1970s when it became possible to cut DNA and to transfer particular pieces of DNA from one type of organism into

**Objectives of Genetic Engineering:**

The important objectives of genetic engineering are as follows.

i. Isolation of a particular gene or part of a gene for various purposes such as gene therapy.
ii. Production of particular RN A and protein molecules.
iii. Improvement in the production of enzymes, drugs and commercially important organic chemicals.
iv. Production of varieties of plants having particular desirable characteristics.
v. Treatment of genetic defects in higher organisms.

**vi. What are single cell proteins? Describe their importance.**

**Ans: Single-Cell Protein:**

The protein content extracted from pure or mixed cultures of algae, yeasts, fungi or bacteria; the micro-organisms are grown in fermenters where they produce a high yield of protein.

**Importance of Single-Cell Protein:**

a. Single-Cell Protein (SCP) refers to the protein content extracted from pure or mixed cultures of algae, yeasts, fungi or bacteria. For the production of single-cell proteins, the microorganisms are grown in fermenters. These microorganisms utilize a variety of substrate like agricultural wastes, industrial wastes, natural gas like methane etc. Microorganisms grow very vigorously and produce a high yield of protein. The protein content produced by microorganisms is also known as novel protein or minifood.

b. Due to over-population, the world is facing the problem of food shortage. In future, the conventional agricultural methods might not be able to provide a sufficient supply of food (especially proteins).

c. For a better management of food shortage problems (in humans and domestic animals), the use of microbes as the producers of single-cell proteins has been successful on experimental basis. This technique was introduced by Prof. Scrimshow of Massachusetts Institute of Technology. Scientist and food technologists believe that single-cell proteins will substitute the other protein-rich foods in human and animal feeds.

d. All scientists recognize the significance of the production of single-cell proteins. The microorganisms grow very vigorously and produce a high yield. It has been calculated that 50 kilogram of yeast produces about 250 tons of protein within 24 hours. Algae grown in ponds produce 20 tons (dry weight) of protein per acre/year. This yield of protein is 10-15 times higher than soybeans and 20-50 times higher than corn. When single-cell proteins are produced by using yeasts, the products also contain high vitamin content.

e. In the production of single-cell proteins, industrial wastes are used as raw materials for microorganisms. It helps in controlling pollution.

The use of single-cell proteins has good prospects in future because they contain all essential amino acids. Moreover, the production of single-cell proteins is independent of seasonal variations.

**vii. Define biotechnology.**

**Ans: Biotechnology:**

The use of living organisms in systems or processes for the manufacture of useful products or for services for humankind.

**Old Biotechnology:**

Although the term biotechnology is new, the discipline itself is very old. Fermentation and other such processes, which are based on the natural capabilities of organisms, are commonly considered as old biotechnology.

**Modern Biotechnology:**

**Genetic engineering** i.e. the artificial synthesis, modification, removal, addition and repair of the genetic material (DNA) is considered as modern biotechnology.

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks.**

**(2 ×10 = 20)**

**i. Nitrogen Fixation:**

Conversion of nitrogen gas into nitrates is called nitrogen fixation. It occurs in the following ways.

**a. Atmospheric nitrogen fixation:**

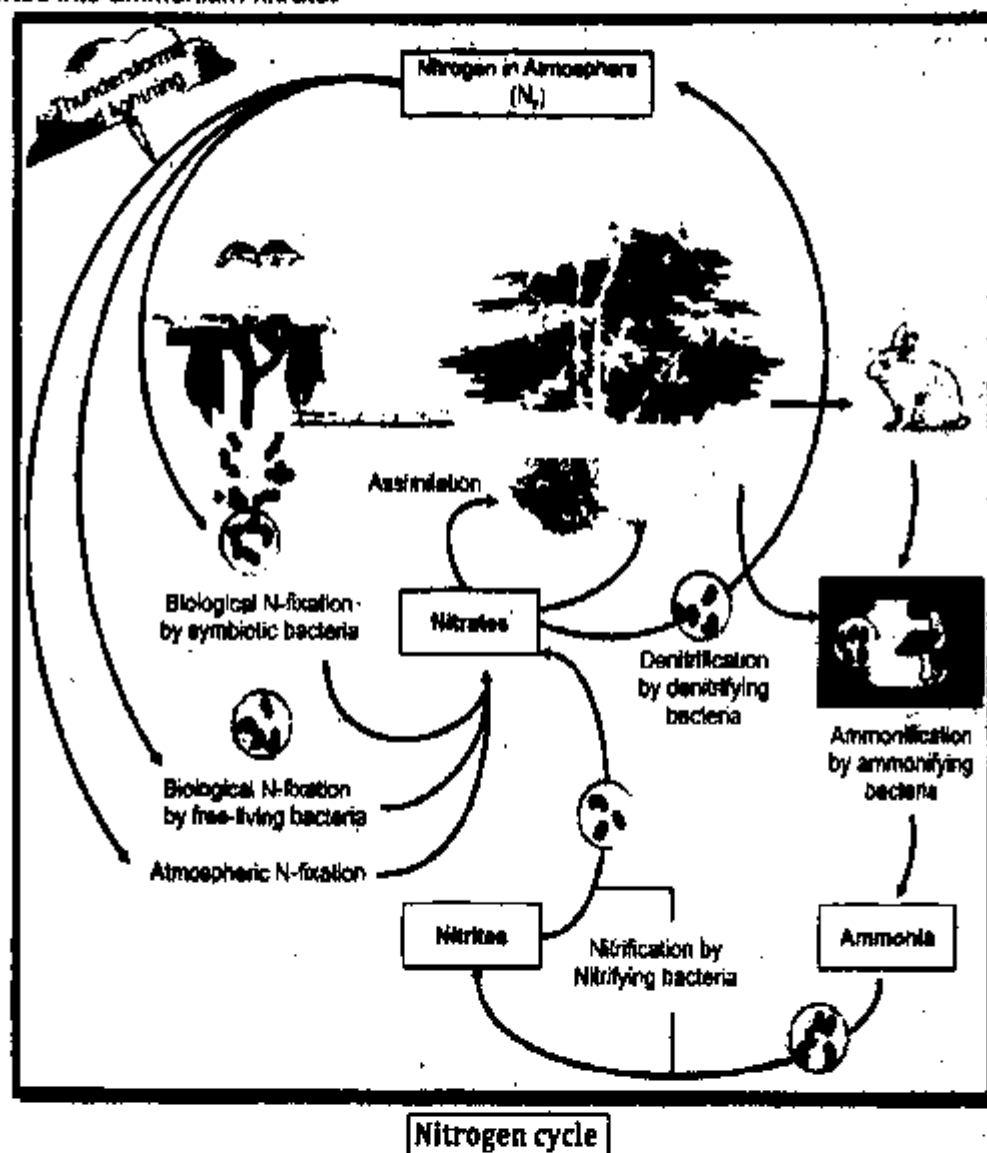
Thunderstorms and lightning convert atmospheric gaseous nitrogen to oxides of nitrogen. These oxides dissolve in water and form nitrous acid and nitric acid. The acids in turn combine with other salts to produce 'nitrates'. It is called as atmospheric nitrogen fixation.

**b. Biological nitrogen fixation:**

Some bacteria also have the ability to transform gaseous nitrogen into nitrates. It is called biological nitrogen fixation. Some of these nitrogen fixing bacteria live as symbionts and many are free-living.

**c. Industrial nitrogen fixation:**

Nitrogen fixation is also done in industries. In industrial nitrogen fixation, hydrogen is combined with atmospheric nitrogen under high pressure and temperature. It produces ammonia which is further converted into ammonium nitrate.

Nitrogen cycle

**ii. Ammonification and Nitrification:**

Ammonification is the breakdown of the proteins of dead organisms and nitrogenous wastes (urea, uric acid etc.) to ammonia. It is done by ammonifying bacteria. After the formation of ammonia, it is converted into nitrites and nitrates. It is called nitrification and is done by nitrifying bacteria. First, ammonia is converted into nitrites by bacteria (e.g. Nitrosomonas). The nitrites are then converted into nitrates by other bacteria (e.g. Nitrobacter).

**b. Assimilation:**

The nitrates formed by the above processes, are absorbed by plants and are utilized for making

c. **Denitrification:**

It is a biological process in which nitrates and nitrites are reduced to nitrogen gas by denitrifying bacteria. By this process, nitrogen is returned to atmosphere.

**Note:** Excessive denitrification reduces soil fertility and is stimulated by water logging, lack of aeration and accumulation of organic matter in the soil.

**Q5. Write notes on competition, predation and symbiosis.**

**Ans: i. Competition:**

In ecosystems, the natural resources e.g. nutrients, space etc. are usually in short supply. So there is a competition among the organisms of ecosystem for the utilization of resources. The competition may be intraspecific or interspecific.

Intraspecific competition is always stronger and more severe than the interspecific competition. Competition helps in maintaining a balance between the available resources and the number of individuals of a species.

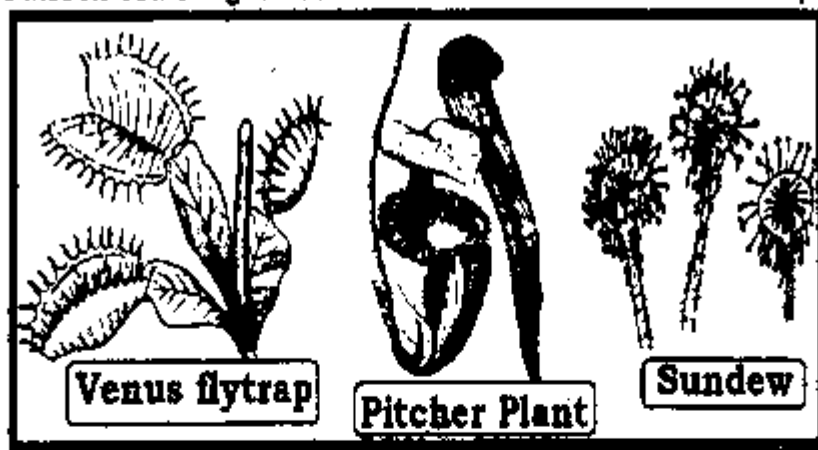
Plants also show competition for space, light, water and minerals.

**ii. Predation:**

It is an interaction between two animals of different species or between a plant and an animal. In predation, one organism (the predator) attacks, kills and feeds on other organism (the prey).

Some examples of predation are given below.

i. All carnivore animals are predators. For example, frog preys upon mosquito and fox preys upon rabbit. There are some examples where a predator is preyed upon by a second predator and then the second one is preyed upon by a third predator. For example, frog (predator 1) is preyed upon by a snake (predator 2) and the snake is preyed upon by an eagle (predator 3).

ii. Certain plants (Pitcher plant, sundew, Venus fly trap etc.) are carnivorous and live as predators. Such plants live in the areas where minerals and other nutrients are lacking. They feed on insects to fulfill their nitrogen requirements. These plants have mechanism to attract insects. For example, they secrete sweet nectar that attracts the insects searching for food. Their leaves are also modified to capture the prey.

Predator Plants

**Note:** Predation keeps the prey population under check, so as to maintain an ecological balance. Humans benefit from this interaction in the biological control of weeds and pests. In order to control pests in an area, their predators are released there.

**iii. Symbiosis:**

It is a relationship between members of different species, in which they live together for longer or shorter periods of time.

**Types of Symbiosis:** Symbiosis is of three types.

a. **Parasitism:**

It is a type of symbiosis (between members of different Species) in which smaller partner (parasite) derives food and shelter from the body of larger partner (host) and, in turn, harms it.

**Temporary Parasitism:**

**Permanent Parasitism:**

In permanent parasitism, the parasites spend their whole life cycle as parasites. Many disease causing bacteria and all viruses are permanent parasites.

**Classificatiion of Parasites:**

Parasites may also be classified as ectoparasites and endoparasites. **Ectoparasites:**

Ectoparasites live outside i.e. on the surface of host's body and get food from there. Mosquitoes, leeches, lice etc. are the examples of ectoparasites.

**Endoparasites:**

Endoparasites live inside the body of host and get food and shelter. Bacteria, viruses, tapeworm, Ascaris, Entamoeba, Plasmodium etc. are the examples of endoparasites.

**Some endoparasites**

**Parasitic plants:**

Some plants (e.g. Cuscuta, also called dodder) are parasites on other plants. Parasitic plants grow special types of roots (haustoria) into host body and suck the required nutrients from the vascular tissues of host.

**Note:** Host can survive without parasite, but parasite cannot survive without host

**b. Mutualism:**

In this type of symbiotic interaction, both partners (of different species) get benefit and neither is harmed.

**For example:**

Termites eat wood but are not able to digest it. A protozoan lives in its intestine. It secretes 'cellulase' enzyme to digest the cellulose of wood. In return, the termite provides food and shelter to the protozoan.

***Rhizobium:***

The nitrogen fixer bacteria *Rhizobium* live in the root nodules of leguminous plants like pea, gram etc. The bacteria obtain food and shelter from plants while in return they fix gaseous nitrogen into nitrates for the plant which is required for their growth.

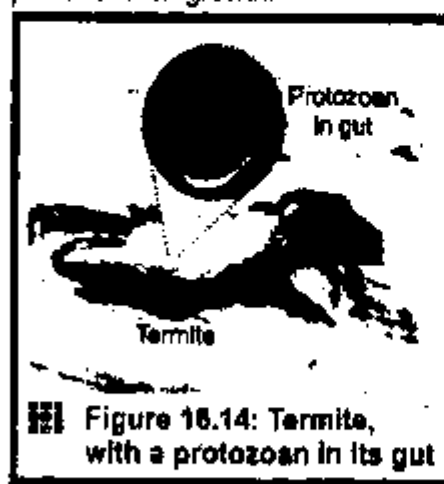



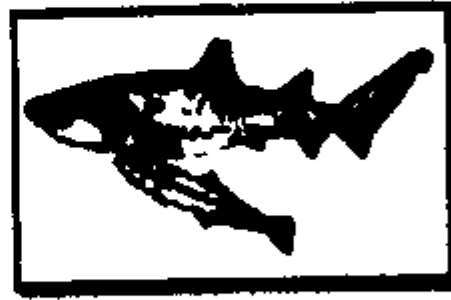
**Figure 16.14: Termite, with a protozoan in its gut**

**Figure 16.15: Bacteria in root nodules**

**Epiphytes:**

Epiphytes are small plants found growing on other larger plants for space only. They absorb water and minerals from atmosphere and prepare their own food. The larger plants are neither benefited nor harmed in any way.

**Sucker fish:**

Sucker fish attaches to the surface of sharks by its sucker. In this way, the shark provides easy transport to the sucker fish to new feeding grounds.

(a) (b)

a – An epiphyte orchid plant growing on a tree trunk

b – A sucker fish attached with shark

**Q6. a. Define biotechnology and describe its importance.**

**Ans: Biotechnology:**

The use of living organisms in systems or processes for the manufacture of useful products or for services for humankind

**Old Biotechnology:**

Although the term biotechnology is new, the discipline itself is very old. Fermentation and other such processes, which are based on the natural capabilities of organisms, are commonly considered as old biotechnology.

**Modern Biotechnology:**

**Genetic engineering** i.e. the artificial synthesis, modification, removal, addition and repair of the genetic material (DNA) is considered as modem biotechnology.

**Scope and Importance of Biotechnology:**

The following are some areas of the application of biotechnology.

**i. Biotechnology in the Field of Medicine:**

In the field of medicine, biotechnologists synthesized insulin and interferon (antiviral proteins) from bacteria and released for sale. A large number of vaccines and antibodies; human growth hormone and other medicines have also been produced. Various enzymes are being synthesized for medicinal as well as industrial use. Gene therapy (treatment through genes) has become important in recent years. Biotechnology also proved much beneficial in forensic medicine. The study of DNA helps in the identification of criminals.

**ii. Biotechnology in the Field of Food and Agriculture:**

Fermented foods (e.g. pickles, yogurt), malted foods (e.g. powdered milk: a mixture of barley, wheat flour and whole milk), various vitamins and dairy products are produced by using microorganisms. Wine and beer are produced in beverage industry. Biotechnology has also revolutionized research activities in the area of agriculture.

**Transgenic:**

Transgenic (organisms with modified genetic set-up) plants are being developed, in which desirable characteristics are present e.g. more yields and resistance against diseases, insects and herbicides. Transgenic goats, chickens, cows give more food and milk etc. Many animals like mice, goats, cows etc. have been made transgenic to get medicines through their milk, blood or urine.

**iii. Biotechnology and Environment:**

Biotechnology is also being used for dealing with environmental issues, like pollution control,

**b. Describe the achievements of genetic engineering in medicine, agriculture and environment.**

**Ans: Achievements of Genetic Engineering in Medicine:**

Various achievements of genetic engineering are as follows.

**Human insulin:**

Human insulin gene was transferred into bacteria. The genetically modified bacteria became able to synthesize insulin. Diabetics are now receiving this insulin.

**Human growth hormone:**

In 1977 an E. coli bacterium was created that was capable of synthesizing the human growth hormone.

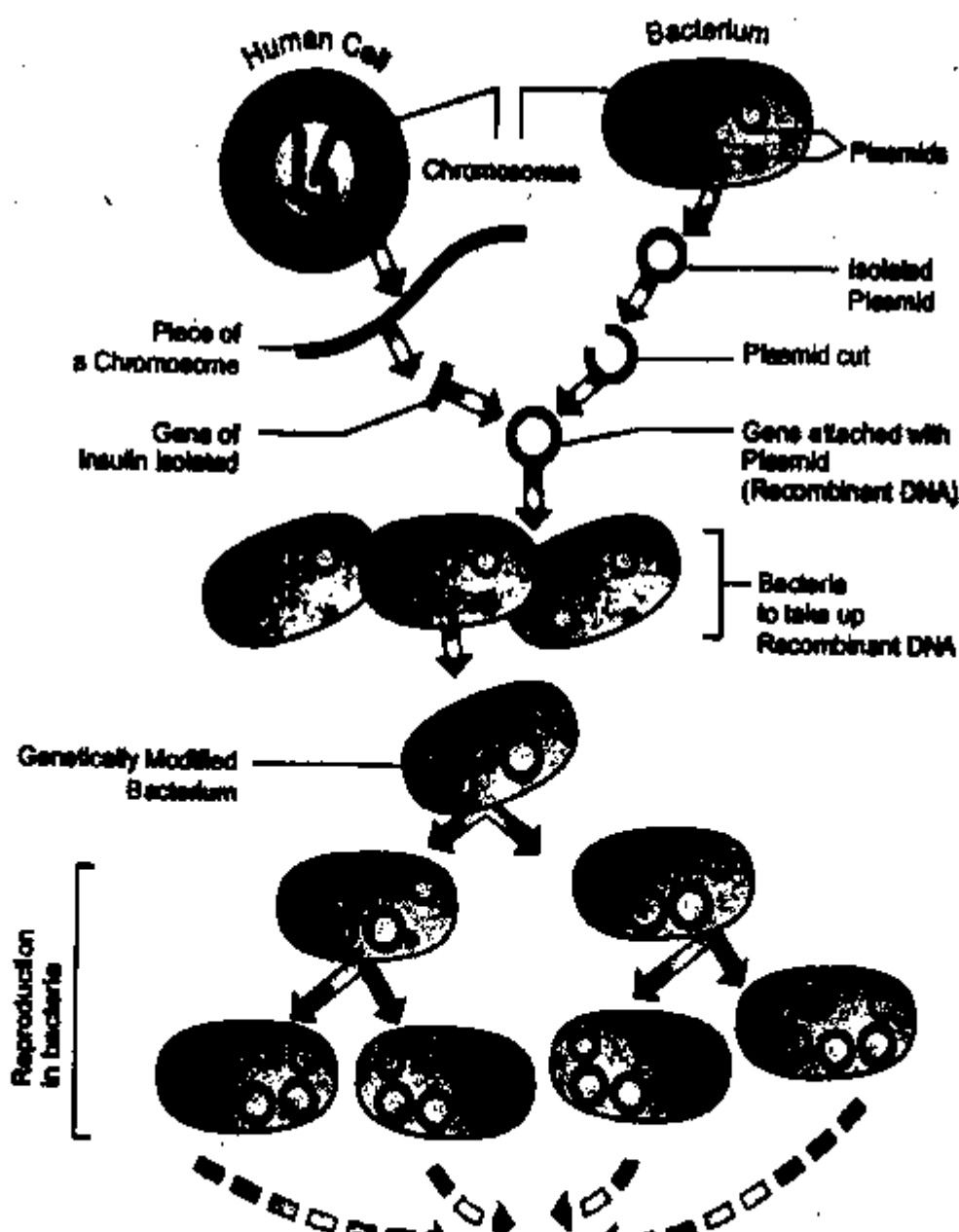
**Hormone Thymosin:**

The hormone thymosin which may prove effective against brain and lung cancer has been produced by genetically modified microorganisms.

**Beta-endorphin:**

Beta-endorphin, a pain killer produced by the brain, has also been produced by genetic engineering techniques.

**Vaccine:**

Genetic engineers produced a safe vaccine against the foot and mouth disease (a viral disease in cattle, goats and deer). Similarly many vaccines have been produced against human diseases such as hepatitis B.

**Interferons:**

Interferons are anti-viral proteins produced by cells infected with viruses. In 1980, interferon was produced in the genetically modified microorganisms, for the first time.

**Urokinase:**

The enzyme urokinase, which is used to dissolve blood clots, has been produced by genetically modified microorganisms.

**Haemophilia:**

Now it has become possible to modify the genes in the human egg cell. This can lead to the elimination of inherited diseases like haemophilia.

**To cure blood diseases:**

Genetic engineering techniques can also be used to cure blood diseases like thalassemia and sickle-cell anaemia, which result from defects in single genes. Normal genes could be transferred into the bone marrow.

**Achievements of Genetic Engineering in Agriculture:**

**Fix nitrogen:**

Genetic engineers have developed plants that can fix nitrogen directly from the atmosphere. Such plants need less fertilizers.

**Achievements of Genetic Engineering in Environment:**

Genetic engineering is also being used for dealing with environmental issues, like pollution control, development of renewable sources for energy, restoration of degraded lands and biodiversity conservation. Bacterial enzymes are used to treat sewage water to purify. Microbes are being developed to be used as biopesticides, biofertilizers, biosensors etc. Such transgenic microorganisms are also used for the recovery of metals, cleaning of spilled oils and for many other purposes.

# GUESS PAPER & MODEL PAPER # 7
## BASED ON CHAPTER # 18 (Reduced Syllabus)
# PHARMACOLOGY

**NOTE:**

1. **Only topic based relevant MCQs. Short and Long Questions are included.**
2. **All information in side boxes is excluded.**

| Chapter Name | Topics Included |
|---|---|
| Pharmacology (Chapter # 18) | Medicinal Drugs (150-151)<br>Antibiotics and Vaccines (155-156) |

## SECTION – A (Marks 12)

**Time Allowed: 20 minutes** **Total Marks: 12**

**Note:** Section-A is compulsory. All parts of this section are to be answered on the question paper itself. It should be completed in the first 20 minutes and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. Do not use lead pencil.

**Q.1 Encircle the correct option i.e. A / B / C / D. All parts carry equal marks.**

**i. Antibiotics are used for the;**
A. Treatment of viral infections B. Treatment of bacterial infections
C. Immunization against infections D. Both 'a' and 'b'

**ii. The substances used for the treatment, cure, prevention or diagnosis of disease are called;**
A. Medicinal drugs B. Narcotics C. Hallucinogens D. Sedatives

**iii. Aspirin is categorized as;**
A. A drug from animals B. A synthetic drug
C. A drug from plants D. A drug from minerals

**iv. The drugs used to reduce pain are known as;**
A. Analgesics B. Antiseptics C. Antibiotics D. Sedatives

**v. Which of the following drugs is obtained from plants?**
A. Aspirin B. Opium C. Cephalosporin D. Insulin

**vi. Which of these addictive drugs are also used as painkillers?**
A. Narcotics B. Sedatives C. Hallucinogens D. All can be used

**vii. Sulfonamides affect bacteria in the following way;**
A. Break the cell wall B. Inhibit protein synthesis
C. Stop the synthesis of new cell wall D. Stop the synthesis of folic acid

**viii. What is true about vaccines?**
A. Protect against the future viral and bacterial infections
B. Treat the existing bacterial infections only
C. Treat existing infections and also protect against future infections
D. Protect against viral infections only

**ix. The pain reliever morphine is made from__________.**
A. datura B. foxglove C. Peyote D. opium

**x. In sterile surgery _______ acid is used to sterilise surgical instruments.**
A. Pyruvic acid B. Lactic acid C. Carbolic acid D. Both A & B

**xi. The Example of sedatives is __________.**
A. Tetracycline B. Diazepam C. Aspirin D. Cephalosporin

# BIOLOGY SSC-II

Time allowed: 2:40 Hours Total Marks: 53

NOTE: Answer any six parts from Section 'B' and attempt any five parts from Section-C. Attempt any two questions from Section 'D' on the separately provided answer book. Use supplementary answer sheet i.e. Sheet-B if required. Write your answers neatly and legibly.

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)**

i. Define Pharmacology.
ii. What do you mean by drug?
iii. Differentiate between Broad-Spectrum and Narrow Spectrum antibiotics.
iv. What is the effect of expired drugs on human body?
v. What do you know about sulfonamide group?
vi. Write a note on Vaccines.
vii. Define the following terms. a. Bactericidal b. Bacteriostatic
viii. What Is the Difference Between Pharmacology and Pharmacy?

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)**

i. Define pharmacology and distinguish it from pharmacy.
ii. Describe the mode of action of vaccines.
iii. Write a note on resistance against antibiotics.
iv. What is marijuana? To which category of addictive drugs, it belongs?
v. Define the following terms. a. Addictive drug b. Antibiotics
vi. Differentiate between medicinal drug and addictive drug.
vii. Define the following terms.
a. Vaccine b. Analgesic c. Medicinal drug

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks. (2 ×10 = 20)**

Q4. What are the sources of drugs? Give examples.
Q5. Describe the main groups of antibiotics.
Q6. Write a note on resistance against antibiotics.

# SOLUTION OF GUESS PAPER & MODEL PAPER # 7

## SECTION- A (MCQs)

| i. B | ii. A | iii. B | iv. A | v. B | xi. A |
|---|---|---|---|---|---|
| vii. D | viii. A | ix. D | x. C | xi. B | xii. D |

## SECTION-B (Marks 18)

**Q.2 Attempt any SIX parts from the following. All parts carry equal marks. (6 × 3 = 18)**

i. Define Pharmacology.

**Ans: Pharmacology:**

Pharmacology is the study of drug composition, properties and medical applications. The sources of

**ii. What do you mean by drug?**

**Ans: Drug:**

Any substance that, when absorbed into the body of a living organism, alters normal body function is known as a drug. Drugs are broadly classified into two types.

i. Pharmaceutical drug or medicinal drug ii. Addictive drugs

**iii. Differentiate between Broad-Spectrum and Narrow Spectrum antibiotics.**

**Ans:** Some antibiotics can be used to treat a wide range of infections and are known as 'broad-spectrum' antibiotics. Others only effective against a few types of bacteria and are called 'narrow-spectrum' antibiotics.

**iv. What is the effect of expired drugs on human body?**

**Ans: Effect of expired drugs on human body:** Expired drugs can cause damage to Kidneys.

**v. What do you know about sulfonamide group?**

**Ans: Sulfonamide group:**

The sulfonamide group is also present in other medications that are not antibiotics e.g. thiazide, diuretics (medicines for lowering blood pressure).

**vi. Write a note on Vaccines.**

**Ans: Vaccines:**

A vaccine is a material containing weakened or killed pathogens and is used to produce immunity to a disease by stimulating the production of antibodies.

In 1796, a British physician, Edward Jenner, infected a young boy with cowpox, by injecting pus cells. After the boy had recovered from cowpox, Jenner injected the pus cells from a smallpox patient into him. The boy did not get smallpox.

So it became clear that intentional infection with cowpox protected people from smallpox. This method was named "vaccination" and the substance used to vaccinate was called a "vaccine".

**vii. Define the following terms. a. Bactericidal b. Bacteriostatic**

**Ans: a. Bactericidal:** The antibiotics that work by killing bacteria

**b. Bacteriostatic:** The antibiotics that work by stopping bacteria multiplying

**viii. What Is the Difference Between Pharmacology and Pharmacy?**

**Ans: Difference between Pharmacology and Pharmacy:**

Pharmacology is not synonymous with Pharmacy which is the name used for a profession. Clinical pharmacology was present in the Middle Ages. Early pharmacologists focused on natural substances, mainly plant extracts. Pharmacology developed in the 19th century as a biomedical science.

## SECTION – C (Marks 15)

**Q.3 Attempt any FIVE parts from the following. All parts carry equal marks. (5 × 3 = 15)**

**i. Define pharmacology and distinguish it from pharmacy.**

**Ans: Pharmacology:**

Pharmacology is the study of drug composition, properties and medical applications. The sources of drugs are also studied in pharmacology.

**Pharmacy:** A store where medicinal drugs are dispensed and sold.

The science or practice of the preparation and dispensing of medicinal drugs is called pharmacy.

**Difference between Pharmacology and Pharmacy:**

Pharmacology is not synonymous with Pharmacy which is the name used for a profession. Clinical pharmacology was present in the Middle Ages. Early pharmacologists focused on natural substances, mainly plant extracts. Pharmacology developed in the 19th century as a biomedical science.

**ii. Describe the mode of action of vaccines.**

**Ans: The Mode of Action of Vaccines:**

Pathogens contain special proteins called **"antigens".** When pathogens enter the body (blood) of host, these proteins stimulate the immune response in host i.e. synthesis of **"antibodies".** Antibodies bind to pathogens and destroy them. In addition, "memory cells" are produced, which remain in blood and provide protection against future infections with the same pathogen.

antibodies against them. These antibodies remain in blood and provide protection against pathogens. If real pathogens enter blood, the already present antibodies kill them.

**iii. Write a note on resistance against antibiotics.**

**Ans: Antibiotic Resistance:**

Antibiotics are extremely important in medicine, but unfortunately bacteria are capable of developing resistance to them. Such bacteria are not affected by commonly used antibiotics.

Bacteria have number of ways of developing resistance. Sometimes, their internal mechanism stops the working of antibiotic. Bacteria can also transfer the genes responsible for antibiotic resistance between them. So such resistant bacteria make it possible for other bacteria to acquire resistance. Another reason for increasing antibiotic resistance in bacteria is their use in diseases in which they have no efficacy (e.g. antibiotics are not effective against infections caused by viruses).

Resistance to antibiotics poses a serious and growing problem, because some infectious diseases are becoming more difficult to treat. Some of the resistant bacteria can be treated with more powerful antibiotics, but there are some infections that do not eliminate even with new antibiotics.

**iv. What is marijuana? To which category of addictive drugs, it belongs?**

**Ans: Marijuana (Hashish):**

Marijuana is a hallucinogen, which is smoked. It is obtained from the flowers, stems, and leaves of the marijuana plant (*Cannabis sativa and C. indica*). Small doses of marijuana result in a feeling of well-being that lasts two to three hours. High doses increase heart rate. It also affects the production of sperms in men and also weakens the short-term memory.

**Category:** Marijuana belongs to hallucinogens drugs.

**v. Define the following terms. a. Addictive drug b. Antibiotics**

**Ans: a. Addictive drug:** The drug which makes a person dependent on it, or addicted.

**b. Antibiotics:** The medicines which inhibit or kill bacteria.

**vi. Differentiate between medicinal drug and addictive drug.**

**Ans: Medicinal Drugs:**

A pharmaceutical drug or medicinal drug is defined as any chemical substance used in the diagnosis, cure, treatment, or prevention of disease.

**Addictive drugs:**

Some drugs often make person dependent on them, or addicted. These may be called as addictive drugs. By using such drug, the person's body becomes familiar to it and the user cannot function well without it.

**vii. Define the following terms.**

**a. Vaccine b. Analgesic c. Medicinal drug**

**Ans:**

**a. Vaccine:** The material used to produce immunity to a disease by stimulating the production of antibodies.

**b. Analgesic:** The medicines that reduce pain.

**c. Medicinal drug:**

Any chemical substance intended for use in the medical diagnosis, cure, treatment, or prevention of disease.

## SECTION – D (Marks 20)

**Note: Attempt any TWO questions from the following. All questions carry equal marks.**

**(2 ×10 = 20)**

**Q4. What are the sources of drugs? Give examples.**

**Ans: Sources of Drugs:** Drugs are obtained from the following sources.

**i. Synthetic Drugs:** Such drugs do not occur naturally but are synthesized in laboratory. Pharmaceutical companies produce these drugs e.g. aspirin.

**ii. Drugs from Plants and Fungi:**

Many important medicines are obtained from plants and fungi. These medicines include antibiotics, cardiotonics and certain analgesics. The antibiotic penicillin comes from a fungus. The cardiotonic, known as

Digitalis (foxglove)

**iii. Drugs from Animals:**

Drugs obtained from animals are usually their glandular products. Fish liver oils, musk, bees' wax, certain hormones and antitoxins are obtained from animal sources.

**iv. Drugs from Minerals:**

Several common drugs are produced from minerals. The mineral iodine is used in making tincture of iodine, a liquid that helps prevent infection when applied to cuts and bruises. The powder form of silver nitrate is applied on wounds to stop bleeding and prevent infection.

**v. Drugs from Bacteria:** Many antibiotics e.g. streptomycin are obtained from bacteria.

**Q5. Describe the main groups of antibiotics.**

**Ans: Antibiotics:**

An antibiotic is a drug that kills or retards the growth (reproduction) of bacteria. They are the chemicals produced by or derived from microorganisms (bacteria and fungi).

**Bactericidal and Bacteriostatic antibiotics**

Antibiotics are used to treat many different bacterial infections. Some antibiotics are 'bactericidal', meaning that they kill bacteria. Others are 'bacteriostatic', meaning that they work by stopping bacterial growth.

**Main Groups of Antibiotics:**

Three major groups of antibiotics are described below.

**i. Cephalosporins:**

Cephalosporins interfere with synthesis of bacterial cell wall and so are bactericidal. Cephalosporins are used to treat pneumonia, sore throat, tonsillitis, bronchitis etc.

**ii. Tetracyclines:**

These are broad-spectrum bacteriostatic antibiotics and inhibit bacterial protein synthesis. Tetracyclines are used in the treatment of infections of respiratory tract, urinary tract, intestine etc. Tetracyclines are not used in children under the age of 8, and specifically during periods of tooth development.

**iii. Sulpha Drugs – Sulfonamides:**

Sulpha drugs are synthetic antibiotics that contain sulfonamide group. Sulfonamides are broad spectrum bacteriostatic antibiotics. They inhibit the folic acid synthesis in bacteria. They are used to treat pneumonia and urinary tract infections.

**Q6. Write a note on resistance against antibiotics.**

**Ans: Antibiotic Resistance:**

Antibiotics are extremely important in medicine, but unfortunately bacteria are capable of developing resistance to them. Such bacteria are not affected by commonly used antibiotics.

Bacteria have number of ways of developing resistance. Sometimes, their internal mechanism stops the working of antibiotic. Bacteria can also transfer the genes responsible for antibiotic resistance between them. So such resistant bacteria make it possible for other bacteria to acquire resistance. Another reason for increasing antibiotic resistance in bacteria is their use in diseases in which they have no efficacy (e.g. antibiotics are not effective against infections caused by viruses).

Resistance to antibiotics poses a serious and growing problem, because some infectious diseases are becoming more difficult to treat. Some of the resistant bacteria can be treated with more powerful antibiotics, but there are some infections that do not eliminate